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ARITHMETICAL PROBLEMS



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—OF—

Arithmetical Problems

—FOR—

SENIOR AND ENTRANCE CLASSES IN PUBLIC SCHOOLS

—BY—

G. H. ARMSTRONG,

Principal Niagara Street School, Toronto.

This edition contains nearly 900 Problems. The Entrance Papers for the last *fourteen years* are appended, also the Public School Leaving Examination Paper for 1893. The answers to all the problems are given. No other work possesses these features. Seventy-five per cent. of the Public Schools of Ontario use it, also several Commercial Colleges.

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I am highly pleased with your Arithmetical Problems for Senior Classes. It suits my Entrance candidates exactly. A book such as this is needed by every Fourth Class pupil.—GEO. KIRK, Head Master M.S., Chatham.

I have just examined your Arithmetical Problems for Senior Classes. The problems are very suitable and the collection must prove very valuable to teachers. I heartily commend it.—G. D. PLATT, B.A., P.S. Inspector, Prince Edward.

After a careful examination of your "Arithmetical Problems for Senior Classes," I find them well graded and very suitable for the purpose intended. The teacher who uses them for home or class work, will save himself a vast amount of labor and in all probability secure to his pupils much better results.—J. S. DEACON, Inspector, Halton.

I have no hesitation in saying that for the purpose for which it is intended the work is infinitely the best with which I am acquainted. Its strong point, to my idea, is the logical sequence in the problems by which the pupil is almost insensibly led on step by step until he reaches quite a difficult style of question. The printer, too, has done his work very well, and there are but few typographical errors. I shall certainly recommend every teacher in my inspectorate to use a copy.

—J. C. MORGAN, M. A., Inspector, Barrie.

ARITHMETICAL PROBLEMS

SUITABLE FOR

SENIOR CLASSES

IN THE PUBLIC SCHOOLS AND CANDIDATES

FOR THE

ENTRANCE EXAMINATIONS TO HIGH SCHOOLS
AND COLLEGIATE INSTITUTES.

PREPARED AND SELECTED

BY

G. H. ARMSTRONG,

Principal, Niagara Street School, Toronto,

TORONTO:

THE COPP, CLARK COMPANY, LIMITED.

PREFACE.

THIS little book of Arithmetical Problems is designed to aid busy teachers in search of practical exercises for their senior classes in public schools. A large part of it was originally prepared by the author for his own classes, in order to supply a want created by the present authorized Public School Arithmetic.

While part of this work is original, all recent works on this subject in England and America have been consulted, and wherever anything was found suitable for our Canadian schools, it has been freely used, and the debt due is as freely acknowledged.

G. H. ARMSTRONG.

TORONTO, *July, 1890.*

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ARITHMETICAL PROBLEMS.

I.

1. A boy gave $\frac{2}{3}$ of his money for a pair of skates and $\frac{1}{2}$ of the remainder for a book. He had \$2.10 left; how much money had he at first?

2. A farmer gave $\frac{3}{8}$ of his money for a horse and had \$60 more left than he spent; how much had he before he bought the horse?

3. A can do a piece of work in 4 days, B in 7 days; how long will it take both working together to do it?

4. A boy can do a certain work in 9 days and his father can do it in $5\frac{1}{2}$ days; how long will it take both working together to do it?

5. Two men can dig a certain ditch in 9 days, one of them can do it alone in 12 days; how long will it take the other man to do it alone?

6. A, B and C can perform a certain work in 6 days. A can do it in sixteen days, B in $23\frac{1}{2}$ days; how long will it take C to do it?

7. Two boys can do a work in $8\frac{1}{2}$ days, one of them can do it alone in 14 days; how long will it take the other boy to do it?

8. A man can mow a certain field in 5 days, his son can mow it in 7 days. The son works at it for two days alone and then leaves; how long will it take his father to finish it?

9. A can perform a certain job in 5 hours, B in $4\frac{1}{2}$ hours, C in 6 hours. All work together at it for an hour when A and B leave; how long will it take C to finish it?

10. A in 2 days can do as much work as B in 3 days; together they take 14 days to do a certain work. In what time would A alone have done it?

II.

1. A man can perform a certain amount of work in $\frac{1}{3}$ of a day, his son can do it in $\frac{1}{4}$ of a day; how long will it take both working together to do it?

2. There are two pipes running into a cistern, one of which can fill it in 4 hours, the other in 5 hours ; there is also a pipe running out of it which can empty it in 8 hours. If the cistern is empty and all the pipes are opened at the same time, in how many hours will it be full ?

3. A can do a certain work in a day, B can do it in $\frac{2}{3}$ of a day, and C in $\frac{1}{2}$ a day ; how long will it take all working together to do the work ?

4. A drover sold $\frac{1}{3}$ of his flock to A, $\frac{1}{5}$ of the remainder to B and the rest to C ; how many had he at first, if C got 32 ?

5. It takes 87 yards of carpet $1\frac{1}{4}$ yards wide to cover a room ; how many more yards will it take, if the width be $\frac{3}{4}$ of a yard ?

6. A and B can do a certain piece of work in 4 days, A and C in 5 days, B and C in 6 days ; how long will it take the three working together to do it ?

7. A and B can finish a piece of work in $1\frac{1}{2}$ days, A and C in 2 days, and B and C in 3 days. If \$1.44 be paid for the piece of work, what are a day's wages of each workman ?

8. A woman loses $\frac{4}{11}$ of her money through a hole in her pocket ; she had \$4.20 left ; how much money did she lose ?

9. What number must be added to $\frac{1}{3}$ of $2\frac{1}{4}$ to give $3\frac{2}{5}$?

10. A and B can do a piece of work in $6\frac{2}{3}$ days, A and C in $5\frac{1}{2}$ days, and A, B and C in $3\frac{1}{4}$ days , in how many days can A do it alone ?

III.

1. What will \$350 amount to in 3 years at 8% per annum ?

2. Find the interest on \$650 for $3\frac{3}{4}$ years at 6% per annum .

3. If I put \$25 in the Savings Bank, which pays $3\frac{1}{2}\%$ per annum, how much interest will be due me at the end of six months ?

4. What sum should be paid for the use of \$250 for three months, if money is worth 8% per annum ?

5. If \$600 amount to \$744 in 3 years, what was the rate per cent. per annum of interest ?

6. What sum will amount to \$1,200 in 4 years at 5% per annum ?

7. If \$500 amount to \$700 in a certain time at 5% per annum, find the time .

8. A sum of money was loaned for 5 years at 8% and amounted to \$70 ; what was the sum ?

9. In what time will a sum of money double itself at 8% per annum ?

10. What is money worth if \$50 amount to \$54 in 292 days ?

IV.

1. In how many years will \$560 amount to \$756, at 7% interest per annum ?

2. Find the interest on \$250 from May 2 to July 14, at 4% per annum.

3. On the 10th of May \$730 was lent at 5% per annum. In what time had the interest amounted to \$8.20 ?

4. When money was worth 6% per annum, I had to pay \$19.14 for the use of \$365. How many days had I the money ?

5. At what rate per cent. will the principal amount to $1\frac{7}{8}$ of itself in 2 years 8 months ?

6. At what rate per cent. will \$2,293.75 double itself in 25 years ?

7. Find the interest on \$150 from June 1 to November 15, at 6% per annum.

8. If the use of \$1,000 for $2\frac{1}{2}$ years costs me \$162.50, how many cents interest am I paying every year on each dollar ?

9. At what rate per cent. will \$325.25 amount to \$393.55 $\frac{1}{4}$ in $3\frac{1}{2}$ years ?

10. I borrowed from a banker \$730 on the 16th of July, and on the 30th of August repaid him in full with \$739.90 ; what rate per cent. per annum did he charge me ?

V.

1. A merchant buys an article for \$7.50 and sells it at a gain of 20% ; find the selling price of the article.

2. By selling cloth at \$2.50 a yard a merchant gains 25% ; find the cost of the cloth per yard.

3. A drover sells a flock of sheep at \$4.00 each, and by so doing loses 20% ; find the cost of the sheep per head.

4. A man buys a horse for \$90, and immediately after sells it for \$117 ; find his gain per cent.

5. If $3\frac{3}{4}$ tons of sulphur are required to make $31\frac{1}{4}$ tons of gunpowder, what is the per cent. of sulphur in the gunpowder ?

6. Teas at 60 cents, 87 cents, and 96 cents a pound are mixed in equal quantities, and sold at 90 cents a pound ; find the gain per cent.

7. By selling a horse for \$200 a dealer loses 12% ; what could he have gained per cent. by selling it at \$250 ?

8. If by selling goods for $12\frac{1}{2}\%$ profit a merchant clears \$800, what was the cost of the goods ?

9. A merchant deducts 5% from the marked price for cash. What is the marked price of an article for which he receives \$7.12 $\frac{1}{2}$ cash ?

10. A dishonest grocer gains 12% by using false weights ; find the real weight of his pound.

VI.

1. A merchant buys 400 yards of silk for \$384, and sells 300 yards at \$1.32 a yard, and the rest, which is damaged, at 48 cents a yard ; find how much per cent. he gains or loses .

2. A grocer mixes two kinds of tea which cost him 38 cents and 44 cents a pound respectively ; what must be the selling price of the mixture in order that he may gain 15% on his outlay ?

3. What is the premium on a policy of insurance for a house and barn valued at \$2,700 at $\frac{3}{4}\%$?

4. If by selling a horse for \$40 I lose 20%, what should I have sold him for so as to gain 10% ?

5. If a tradesman gains \$1.32 on an article which he sells for \$5.28, what is his gain per cent. ?

6. A grocer uses for a pound weight one which only weighs 15 $\frac{3}{4}$ oz. ; what does he gain per cent. by his dishonesty ?

7. A man sells two horses at \$100 each, on one of them he gains 25%, and on the other he loses 25% ; find his gain or loss per cent. on both .

8. A boy buys chestnuts at \$2.50 a bushel and sells them at 5 cents a pint ; what per cent. does he make ?

9. A sold a carriage to B and gained $7\frac{1}{2}\%$; B sold it to C for \$141.90 and lost 12%. How much did the carriage cost A ?

10. If by selling an article for \$9.50 I lose 5%, for how much should I sell it so as to gain 5% ?

VII.

1. A rectangular field containing 15 acres is 60 rods long. How many trees 20 feet apart will be required to plant a row around it ?

2. How long will it take a train 20 rods long and going at the rate of 15 miles an hour to cross a bridge 15 rods long ?

3. A boy spent \$3.20 more than $\frac{3}{8}$ of his money, and had \$4 left; how much had he at first?

4. I bought a Jersey cow in England for £18 10s. 6d.; paid for carriage to Canada £2 15s., where I sold her for \$140. Find my gain in Canadian currency.

5. A can do a piece of work in $\frac{1}{3}$ of a day, B can do it in $\frac{1}{5}$ of a day, and C in $\frac{1}{6}$ of a day. How long will it take all working together to do it?

6. I sold two horses for \$150 each; on one I gained 20%, and on the other I lost 20%. (1) Find my gain or loss on both. (2) Find my gain or loss per cent. on both.

7. If a merchant sells tea at 66 cents a pound, and gains 20%, what per cent. will he gain if he sells at 77 cents a pound?

8. Divide \$840 among A, B and C, so that B may have \$100 less than A, and \$40 more than C.

9. The diameter of the driving wheel of an engine is 7 feet; how often will it revolve in going 2 miles?

10. A and B can do a piece of work in 4 days, B and C in 6 days, and A and C in 8 days. How long will it take A, B and C together to do it?

VIII.

1. How many pounds of tea at 70 cents a pound must I mix with 50 pounds at \$1.00 a pound in order to sell the mixture at 80 cents a pound without loss?

2. Find the cost, at 30 cents a square yard, of plastering a room 30 feet long, 20 feet wide and 16 feet high; wainscoting 4 feet high.

3. Telegraph poles are placed 8 rods apart, and a train passes one every $4\frac{1}{2}$ seconds; how many miles an hour is the train going?

4. From 200 acres take 199 acres, 3 roods, 39 square perches, 30 square yards, 2 square feet, 36 square inches.

5. A farmer sold 100 geese and turkeys, receiving for the geese 75 cents each, and for the turkeys \$1.25 each, and for all \$104; find the number of each.

6. A has a hog weighing 300 pounds, and B has one weighing 500 pounds. C buys both hogs weighed together for 5 cents a pound. The three men agree that A's hog is worth $\frac{1}{2}$ cent more a pound than B's, and that it shall be paid for accordingly. How much per pound will each receive for his hog?

7. A can do a piece of work in 8 days, B in 6 days; they work together for 2 days when A quits. In what time will B finish it?

8. I bought eggs at the rate of 5 for 2 cents ; how many may I sell for 14 cents so as to gain 40% ?

9. Find the times between 9 and 10 that the hands of a clock are 7 minutes apart.

10. A dealer in Brampton expends \$200 in Scranton coal ; he pays \$4.50 per long ton for the coal in Scranton. The freight from Scranton to Brampton is 50 cents a long ton. He sells it in Brampton at \$6.50 a short ton ; find his total gain.

IX.

1. Find the greatest number that will divide 392 and 257, leaving as remainders 7 and 12 respectively.

2. Five-sevenths of $\frac{1}{2}$ of a number is 75. What is the number ?

3. A farmer sold 24 dozens eggs at $22\frac{1}{2}$ cents a dozen, and 12 pounds of butter at $27\frac{1}{2}$ cents a pound. He was paid in tea at 87 cents a pound. How many pounds of tea should he receive ?

4. A man engaged to work a year for \$600 and a suit of clothes. At the end of 8 months a just settlement was made by giving him \$390 and the suit of clothes. What was the value of the clothes ?

5. Divide $125\frac{1}{2}$ acres of land among A, B and C, giving C $7\frac{1}{4}$ acres more than B, and B $12\frac{3}{4}$ acres more than A.

6. A sold B a watch for $\frac{1}{2}$ more than it cost him. B sold it to C for \$36, which was $\frac{1}{4}$ less than it cost him. What did A pay for it ?

7. At what time between 4 and 5 o'clock will the hands of a watch be exactly over each other ?

8. A man buys a carriage and a set of harness for \$232 ; for the carriage he pays seven times as much as for the harness. Find the cost of each.

9. A train leaves a certain station at 9.30 a.m., and goes $27\frac{1}{3}$ miles an hour. Another train leaves at 10.15 a.m., and goes 41 miles an hour. When will the latter overtake the former ?

10. A man buys a lot for \$750 and immediately thereafter sells it for \$862.50. Find his gain per cent.

X.

1. What is the least number which when divided by 24 or 27 always leaves 4 for remainder ?

2. If it costs \$1.75 to gravel 12 feet of road, how much will it cost to gravel 4 miles ?

3. A hound in pursuit of a fox runs 9 rods while the fox runs 7, but the fox had a start of 70 rods. How far will the hound run before he overtakes the fox ?

4. If $\frac{2}{3}$ of a farm is worth \$7,524 at \$45 an acre, how many acres are in the farm?

5. Find the value of a pile of cordwood 120 feet long and 6 feet high at \$3.50 per cord.

6. In a certain school there are 40 pupils present on Monday, on Tuesday there are 42, on Wednesday 44 on Thursday 45 and on Friday 34. Find the average daily attendance for the week.

7. How many hours from 10.15 a.m. Tuesday until 7.45 p.m. Sunday?

8. A race course measures 1 furlong, 8 rods, 2 yards, 2 feet. How often must one go around it to travel 5 miles?

9. A man bought 34,750 pounds of hay at \$15 a ton, and sold the same at 85 cents a cwt. How much did he gain?

10. Two trains respectively 210 feet and 180 feet in length are going in opposite directions, the first at the rate of 24 miles per hour, and the other at the rate of 27 miles per hour. Find how long they will take to pass each other.

XI.

1. If A can do a work in $3\frac{3}{4}$ days and B in $4\frac{1}{2}$ days, in what time will both working together do the work?

2. Find the expense of fencing a railway 73 miles in length, at the rate of \$5.50 per rod.

3. If a wheel makes 260 revolutions in passing over 1 mile, 520 yards, 2 feet, what is its circumference?

4. In one scale are $3\frac{1}{2}$ pounds troy, in the opposite 3 pounds avoirdupois. How many more grains in one scale than in the other?

5. If $\frac{3}{4}$ of a dollar buy $\frac{4}{11}$ of a pound of tea, how much is the tea per pound? (Answer in cents.)

6. How much wheat is necessary to sow a field containing $7\frac{3}{4}$ acres if $\frac{3}{4}$ of an ounce is sown on every square yard?

7. How many minutes between 12 o'clock noon May 24th and 9.30 a.m. of September 3rd?

8. If a man working $9\frac{3}{4}$ hours per day finishes a piece of work in 6 days, in what time would he have finished it if he had worked $8\frac{1}{2}$ hours per day?

9. A and B together can saw a cord of wood in 5 hours, B and C 2 cords in 12 hours and A and C $1\frac{1}{2}$ cords in $10\frac{1}{2}$ hours. How long will it take the three to saw a cord?

10. A house and lot costs \$3,600; the value of the lot is $\frac{1}{5}$ that of the house. Find the value of each.

XII.

1. A man invested $\frac{3}{4}$ of his capital in bank stock, $\frac{3}{4}$ of the remainder in real estate, and had still \$6,000 left. Find his capital.

2. 797 tons, 19 cwt., 2 qrs. 414 lbs. are divided among a certain number of people, so that each receives 5 tons, 3 cwt., 2 qrs., 16 lbs. How many people are there?

3. A person after paying out of his income for a year a tax of 4 cents in the dollar has \$7,200 left. Find his income for a year.

4. A boy buys papers at 10 cents a dozen and sells them at 2 cents each. He sells 19 every day, leaving out Sundays. How much will he clear in a year?

5. A pile of wood 29 feet long, 8 feet 4 inches high, and 4 feet wide, was sold at \$5.12 $\frac{1}{2}$ a cord, to pay for carpeting a room 18 $\frac{1}{2}$ feet long and 16 feet 8 inches wide; carpet 27 inches wide at 80 cents a yard. How much money was over?

6. The dividend is one billion two hundred and twenty million two hundred and thirty thousand and ninety-two, the quotient six thousand and eighty four, and the remainder four thousand eight hundred. Find the divisor.

7. What must be the length of a plot of ground, if the breadth is 15 $\frac{3}{4}$ feet, that its area may contain 46 square yards?

8. A cannon ball travels at the rate of 1,500 feet in a second and a half; how far will it have gone in $1\frac{1}{8}$ of a minute?

9. What number increased by 125 and the result decreased by 73 will give 525?

10. The chain for measuring land is 66 feet long, and is divided into 100 links; what is the cost of a fence 2,456 links in length at \$8.86 per yard?

XIII.

1. The difference between the product of two numbers and 270 is ten millions ten thousand and ten; one of the numbers is twenty-one thousand and thirty; what is the other number?

2. A pint contains 34 $\frac{3}{8}$ cubic inches; how many gallons of water will fill a cistern 4 feet 4 inches long, 2 feet 8 inches broad and 1 foot 1 $\frac{1}{2}$ inches deep?

3. How many bales of hay each weighing 37 $\frac{1}{2}$ pounds can be made out of 25 tons 4 cwt. 3 qrs. 15 lbs. of hay?

4. By selling shoes at \$2.75 per pair I lose $\frac{1}{6}$ of the cost. What must I sell them for to gain $\frac{1}{6}$?

5. A glazier gets $\frac{1}{5}$ of the money his master receives. He gets in a year \$346. If the average price of each pane of glass he puts in is $12\frac{1}{2}$ cents, how many panes has he put in?

6. I sold $427\frac{1}{5}$ bushels of wheat at \$1.15 per bushel, and bought with the money an equal weight of barley at 75 cents per bushel. Had I any money over? If so, how much?

7. A boy's hoop is 2 feet 4 inches in diameter. If the circumference be $3\frac{1}{7}$ times the diameter, how often will the hoop revolve in $\frac{3}{8}$ of a mile?

8. A merchant bought a number of barrels of flour for \$4,600, and sold them for \$5,200, thereby gaining 75 cents a barrel; how many barrels did he buy?

9. A paid \$60 an acre for his farm, which was $\frac{5}{9}$ as much as B paid per acre for his farm of 150 acres; find the entire cost of B's farm.

10. If it takes a man 1 hour and 40 minutes to cut $\frac{1}{2}$ a cord of wood, for how many days of 8 hours each will he be occupied in cutting 186 cords 88 cubic feet?

XIV.

1. A man invests $\frac{1}{2}$ of his fortune in land, $\frac{1}{5}$ in bank stocks, $\frac{1}{6}$ in debentures and loses the remainder, which was \$8,000, in speculation; how much was his fortune?

2. The dividend is fifty-one millions eight hundred and forty-six thousand seven hundred and thirty-four, the quotient is five hundred and eight thousand three hundred and one, and the remainder thirty-two; find the divisor.

3. A man paid \$2,896,875 for land, and sold $56\frac{1}{4}$ acres at \$31 an acre; the remainder then stood him at \$20.05 an acre; how many acres did he buy?

4. On a railway 58 miles long there are 11 stations, including those at the two ends of the road; what is the average distance in yards between the stations?

5. Coffee is 5 times the price of sugar, and tea $8\frac{1}{4}$ times the price of sugar; how many pounds of tea would 25 pounds of coffee buy?

6. A man by selling oranges at 4 for 10 cents gains 25%; if he sells them at 4 for $12\frac{1}{2}$ cents, what will be his gain per cent.?

7. How many can he sell for 10 cents and neither gain nor lose?

8. A man built a wall 15 feet 6 inches long, 7 feet 8 inches high and 2 feet 9 inches thick, with bricks $8\frac{1}{2}$ inches long, $4\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches thick; if the mortar filled up $\frac{1}{12}$, how many bricks were needed?

9. A person bought a certain number of barrels of flour for \$2,200; he reserved 20 barrels for use, and sold $\frac{4}{5}$ of the remainder for \$1,976, which was \$304 more than cost; how many barrels did he buy?

10. A sum of money is divided among 4 persons. The first receives $\frac{1}{3}$, the second $\frac{1}{4}$, the third $\frac{1}{5}$ and the fourth the remainder. It is found that the first receives \$700 more than the fourth. Find the sum received by each.

XV.

1. A hall is 45 feet long and $11\frac{1}{4}$ feet wide; what will it cost to carpet it (1) with carpet 27 inches wide and \$1.75 a yard; (2) with carpet 45 inches wide and \$1.25 a yard?

2. A man's annual income is \$2,400; find how much he may spend per day so that after paying a tax of 2 cents $7\frac{1}{2}$ mills on every dollar of income he may save \$582 a year.

3. If 162 gallons of water will fill a cistern 4 feet 4 inches long, 2 feet 8 inches broad and 2 feet 3 inches deep, how many cubic inches are contained in a pint?

4. Three men can mow a field in 6 days; they mow together for two days, and then one of them ceases work, and the other two finish the field in 7 days; find how long the man who ceased work at the end of the second day would have taken to mow the whole field by himself.

5. Two men start at the same time from places 7 miles apart. The one walks from A to B at the rate of 6 miles per hour. The other walks from B to A at the rate of 5 miles per hour. How long after starting will they meet, and how far from B?

6. A book is $\frac{7}{8}$ of an inch thick. Each cover is $\frac{1}{8}$ of an inch thick, and the book contains 212 pages. What is the thickness of each leaf? (Answer in fraction of an inch.)

7. Divide £375 18s. between A and B, giving A twice as much as B. Allow $24\frac{1}{2}$ cents to the shilling, and give the answer in dollars and cents.

8. A man sold two city lots for \$600 each; on the one he gained $\frac{1}{4}$ of the price, and on the other he lost $\frac{1}{4}$ of the cost price. Find his whole loss on the sale of the two lots.

9. A drover bought a number of cattle for \$4,375, and sold a certain number of them for \$43 a head for the total sum of \$3,655, gaining \$680; for how much per head must he sell the remainder so as to gain \$400 more?

10. The difference between the product of two numbers and 2,431 is three hundred millions, three hundred and three thousand and three. One of the numbers is twenty thousand three hundred and six. Find the other.

XVI.

1. A room is 36 feet long and 24 feet wide. Find the difference in the expense of carpeting it with carpet a yard wide at \$1.40 a yard and with carpet 27 inches wide at \$1.15 a yard.

2. If telegraph posts are placed 80 yards apart, and a train passes one every 4 seconds; how many miles an hour is it running?

3. A person owns $\frac{2}{3}$ of a ship, and sells $\frac{2}{3}$ of his share for \$1,260. What is the value of the ship?

4. If a room be 12 feet square, what must its height be in order that the area of the walls may amount to 60 square yards?

5. A regiment marching 4 miles an hour takes 110 steps in a minute. What is the length of the step?

6. I took three prizes at the Toronto Exhibition; the 2nd prize was $\frac{5}{8}$ of the 1st, and the 3rd $\frac{4}{5}$ of the 2nd. The three prizes amounted to \$45.05; what was the value of each prize?

7. \$100 less than $\frac{2}{5}$ of my money equals $\frac{4}{5}$ of $7\frac{1}{2}$ times \$300; how much money have I?

8. I bought butter at 28 cents a pound and sold 30 pounds of it at a gain of 25%; how much did I get for what I sold?

9. I lent a man \$500 for 8 months at 6% per annum; how much will he owe me at the end of that time?

10. One-half of the sum of two numbers is 350, and one-half their difference is 100; what are the numbers?

XVII.

1. A man leaves $\frac{1}{2}$ his property to his wife, $\frac{1}{6}$ to each of two children, $\frac{1}{12}$ to his brother and the rest, amounting to \$3,000, to charitable purposes. Find the amount of his property.

2. A farmer sold 1,140 pounds of wheat and 782 pounds of oats for \$29.75, receiving 35 cents a bushel more for the wheat than for the oats. Find the price of each per bushel.

3. Bought 290 acres of land for \$9,860, and sold a part of it for \$10,000 at \$40 an acre; how many acres had I remaining, and how much did I gain on every acre sold?

4. A man and a boy engaged to do a piece of work for \$21; when $\frac{2}{5}$ of the work was done the boy went away, leaving the man to finish it alone, the result being that the work occupied $1\frac{1}{2}$ days more than it would have done; the boy was able to do in a given time only half as much work as the man, and was paid accordingly. Find how much the man earned per day.

5. A man and his son did one-half a piece of work in 4 days; the father alone finished it in 6 days; what part of the work did the boy do each day?

6. Find the value of $\frac{3}{4}$ of $\frac{1}{10}$ of an acre in square rods.

7. I have to measure a distance of $3\frac{1}{2}$ miles with a string two rods and two feet long; how often will I have to apply the string in measuring the distance?

8. Which is cheaper, a pair of boots that cost \$3.50 and will wear nine months, or a pair that cost \$4.50 and will wear ten months?

9. A man paid \$1,800 for a house, and rents it at \$10 a month. The taxes amount to \$30, insurance \$5 and repairs \$7; what rate of interest does he get for his money?

10. A merchant bought velvet at \$7 a yard, and sold it at \$6.50; what is his loss per cent.?

XVIII.

1. A tea dealer has teas worth 90 cents and 60 cents per pound respectively, which he mixes, taking two pounds of the former to one pound of the latter, and sells the mixture at 85 cents a pound; what does he gain or lose per cwt.?

2. If 4 men or 6 women can do a piece of work in 20 days, how long will it take 3 men and 15 women to do the same work?

3. A runs at the rate of $266\frac{2}{3}$ yards a minute, and B at the rate of 275 yards a minute; how much start may one give the other so as to win by a yard in a mile race?

4. A man who rows 4 miles an hour on still water takes 1 hour and 12 minutes to row that distance up a river; how long will he take rowing down again?

5. If $\frac{9}{14}$ of a meadow be mown by 12 men in 6 days, find in what time the remainder could be mown by 10 men.

6. What per cent. is 25 of 80?

7. There were 700 pages in a book, but $\frac{1}{4}$ of them are torn out and $\frac{7}{15}$ of the remainder are badly defaced; how many pages are entire?

8. A man had 180 pounds of coffee; he sold 20 pounds and then added 40 pounds of chicory. He then sold 80 pounds of the mixture; how much coffee is there left and how much chicory?

9. If 3 pounds of fish cost as much as 2 pounds of beef, and 4 pounds of beef will buy 5 pounds of mutton; how many pounds of fish will 6 pounds of mutton buy?

10. I gave $\frac{3}{4}$ of $\frac{7}{5}$ of a dollar for $\frac{1}{7}$ of a foot of silk; what was the silk a yard?

XIX.

1. A and B can build a wall in 30 days, and A does twice as much as B ; how long will it take each to build it ?

2. Divide \$4,000 among three persons, so that the first may have three times as much as the second, and the third as much as the first and second together.

3. If $\frac{2}{3}$ of an inch on a map corresponds to 7 miles of a country, what distance on the map represents 20 miles ?

4. A piece of land is $63\frac{1}{2}$ rods long and $27\frac{3}{4}$ rods wide ; what will it cost to fence it at $87\frac{1}{2}$ cents per rod ?

5. A man bought 296 sheep at \$5.50 per head, and, after paying $\frac{2}{11}$ of his outlay in expenses, exchanged them for 37 oxen, which he sold immediately at \$60 a head ; how much did he gain on every \$100 of his expenditure ?

6. When I sold 14 loaves of bread for a dollar, I gained 20%. What per cent. will I gain when I sell 12 for a dollar ?

7. A gave his marbles to B, and then B had $2\frac{1}{4}$ times what C had. If he had given them to C, C would have had $1\frac{2}{5}$ times what B had. All have 130 ; how many has each ?

8. Two men can chop 20 cords of wood in 4 days. How many men can chop one-half the wood in one-half the time ?

9. A plot of ground is 35 yards long and 18 yards broad ; another plot, which contains twice as much land, is 45 yards long ; what is its width ?

10. I have $10\frac{1}{2}$ cords of wood. The pile is 40 feet long and the usual width ; how high is it ?

XX.

1. A man expended \$280.60 in purchasing rye at 95 cents a bushel, wheat at \$1.37 a bushel and corn at 73 cents a bushel, buying the same quantity of each ; find the entire number of bushels purchased.

2. Divide \$153.60 among A, B and C, so that B may have two-thirds as much again as A, and C three-fifths of what A and B together have.

3. A man sold 24 horses for \$150 each ; on half of them he gained $\frac{3}{10}$ of what they cost, and on the remainder lost $\frac{1}{5}$ of what they cost ; find his whole gain or loss.

4. A creditor receives \$1.50 for every \$4 of what was due him, and thereby loses \$301.05. What was the sum due ?

5. What must be given per yard for carpet 27 inches wide, that the carpeting of a room 26 feet long and 15 feet 8 inches broad may cost \$180?

6. A man had 160 acres of land. He laid it out into 600 lots. The streets took up $\frac{1}{8}$ of the whole land. The lots were called $\frac{1}{4}$ of an acre more or less. How much more or less than $\frac{1}{4}$ were they?

7. The sum of three numbers is 24; and six times the 1st, three times the 2nd and twice the 3rd give the same result. Find the numbers.

8. If 3 oranges buy 5 lemons and 2 lemons buy 7 apples, and there be 75 apples in a peck, how many oranges will $1\frac{1}{2}$ bushels of apples buy?

9. A farmer mixed together 28 bushels of barley, 39 bushels of rye and 85 bushels of wheat. He sold 45 bushels of the mixture; how many bushels of rye did it contain?

10. Three men bought \$1,585 worth of land at \$1.75 per acre. They sold 100 acres at \$2 per acre; 160 acres at \$4, and the rest at such a price per acre as would make the whole receipts equal four times what the land cost them. At what price per acre did they sell the last lot?

XXI.

1. What is the least number that must be added to five millions to make the sum exactly divisible by seven thousand and nineteen?

2. A bankrupt owes to A \$1,039.84 and to B \$612.80; if A receives \$357.44 $\frac{1}{2}$, what will B receive?

3. A clock gains $3\frac{1}{4}$ minutes in 15 seconds less than 24 hours; at noon it is 2 minutes too slow; when will it indicate true time?

4. A person expended \$55.92 in tea at $87\frac{1}{2}$ cents per pound, coffee at $18\frac{3}{4}$ cents per pound and sugar at $10\frac{1}{4}$ cents, buying an equal quantity of each; how many pounds of each did he buy?

5. \$90.90 is shared among 4 men, 5 women and 6 children so as to give to each man twice as much as to each woman and to each woman three times as much as to a child. What do the women get?

6. A man bought sheep to the value of \$9,000 and after keeping them 4 weeks, and paying 50 cents each for their pasture during that time, sold the whole for \$14,000 and thereby cleared \$2.00 on each. How many sheep did he buy?

7. I sell $12\frac{1}{2}$ tons of coal for \$80, which is $\frac{1}{7}$ more than cost. Find the gain per cwt.

8. A cistern is $\frac{3}{4}$ full ; one pipe runs out and two run in. The first pipe can empty it in 8 hours, the second can fill it in 12 hours and the third can fill it in 16 hours. There is also a leak half as large as the second pipe ; in how many hours will the cistern be half full ?

9. C owes B $\frac{3}{5}$ of what B owes A, B gives C \$5 to put the accounts between them all straight. What is B's debt to A ?

10. A and B fire at targets, having 55 cartridges each. A fires twice in 3 minutes and B three times in five minutes ; how many times will B have to fire after A has finished ?

XXII.

1. How many times will a carriage wheel 4 feet 2 inches in diameter turn in going 1 mile, 1 furlong, 1 perch ?

2. A farmer sold $\frac{2}{5}$ of his whole amount of land at \$25 per acre, and received for it \$1,000. What amount of land did the farmer own ?

3. Lead weighs $11\frac{2}{3}$ times, and platinum 21 times, as much as water ; find the weight of the platinum that will be equal to 112 pounds of lead.

4. 10 men can do a piece of work in 12 days. After they have worked 4 days, three boys join them in the work, by which means the whole is done in 10 days. What part of the work is done by one boy in 2 days ?

5. A tree of 140 feet in length was broken into two pieces by falling, and $\frac{8}{11}$ of the longer piece was equal to $\frac{4}{7}$ of the shorter ; find the length of each piece.

6. A man bought a number of boxes of oranges for \$600, of which 12 boxes are unsalable. He sold $\frac{2}{3}$ of the remainder for \$400, and gained on them \$40. How many boxes did he buy ?

7. A person left Toronto for Guelph at 9 a.m. and travelled the first 20 miles by rail at the rate of $22\frac{1}{4}$ miles per hour ; he then walked the remaining 32 miles at $\frac{1}{6}$ of that rate. At what o'clock did he arrive ?

8. A room whose height is 11 feet and length twice its breadth, takes 143 yards of paper 2 feet wide for its four walls ; how much carpet will it require ?

9. Two clocks strike together on Tuesday morning. On Wednesday morning one lacks 10 minutes to 11 when the other strikes 11. How much must the slower be put on that they may strike together in the evening ?

10. What sum of money will amount to \$552.50 in 15 months at 5% per annum ?

XXIII.

1. A merchant buys 2 butts of wine, one for \$120 and one for \$110, he also buys a third, and, after mixing the three, retails the wine at \$9 per dozen bottles, making $12\frac{1}{2}\%$ on his outlay ; supposing the number of dozens in a butt to be 52, find the price of the third butt.

2. A plate of copper 2 feet 9 inches wide, 3 feet long and $\frac{3}{4}$ of an inch thick, is rolled into a sheet $1\frac{1}{2}$ inches wide and 18 inches long. Find its thickness.

3. How long will it take to walk round a square field containing 13 acres, 81 yards at the rate of $3\frac{1}{3}$ miles an hour ?

4. Find the price of digging a cellar 41 feet 3 inches long, 24 feet wide and 6 feet deep at 20 cents per cubic yard.

5. Find the total cost of 1,650 pounds of hay at \$8 per ton, and 2,675 feet of lumber at \$10 per thousand feet.

6. If 3 men and 1 boy can do a piece of work in 6 days, and if 1 man and 2 boys can do the same work in 9 days, how long would 6 men and 7 boys require to do the work ?

7. The price of 2 turkeys and 9 geese is \$6.00, and the price of 5 turkeys and 2 geese is \$4.75 ; find the price of a turkey.

8. At what price must I mark cloth which cost me \$2.40 a yard, so that after throwing off $\frac{1}{5}$ of the marked price I may sell it at $\frac{1}{5}$ more than the cost price ?

9. Find the interest on \$7,300 at $3\frac{3}{4}\%$ for 120 days.

10. A bankrupt owes \$2,085, of which \$235 is due to A, \$325 to B, \$525 to C and the rest to D. How much must he pay in the dollar so that D may receive as much as is due to C ?

XXIV.

1. A house built for \$2,656 is sold for \$3,320 ; find the gain per cent.

2. For what sum would the life of a person aged 23 be insured by the annual payment of \$45.60, the premium for that age being \$2.40 per cent. ?

3. If 6 men can dig a trench 30 yards long and 8 yards broad in 6 days of 16 hours each, in how many days of 12 hours each can 8 men dig a trench 40 yards long and 16 yards broad ?

4. What is the interest on \$757.60 for 4 years and 4 months at $6\frac{1}{2}\%$.

5. A man sells a house for \$437.50, and loses $12\frac{1}{2}\%$ on what it costs him ; what did it cost ?

6. If tea be bought at 75 cents per pound and sold at 68 cents per pound, find the loss per cent.

7. Divide 480 into two parts, one of which is three-fifths of the other.

8. A car is exactly filled by barrows that hold 9 hundredweight each and emptied by sacks that hold 5 hundred-weight each ; given that it holds between 8 and 10 tons, find the exact amount.

9. A speculator gave \$18,810 for horses, and sold a certain number of them for \$7,990, at \$85 each, losing thereby \$10 each ; for how much each must he sell the remainder so as to gain \$2,180 on the whole ?

10. The sum of \$288 is to be divided among 24 men, 36 women and 72 children, so that the shares of two men will be equal to that of three women, and each woman's share equal to that of two children ; what will be the share of each ?

XXV.

1. If I buy cloth at \$3.60 a yard, what must I ask for it a yard that I may be able to throw off 10% from my asking price and yet make 25% profit ?

2. I borrowed \$250 on the 1st October, 1875, and paid back \$268 on the 24th February, 1876 ; what rate of interest per annum had I been charged ?

3. A clock marks the true time on Sunday morning at 6 o'clock, and on Tuesday at noon (true time) it has gained 24 minutes ; what will be the true time when it shows 1 o'clock on Saturday afternoon ?

4. A certain piece of work was to be done by 25 men in 16 days ; after 4 days 15 men go away ; how long will it take the rest of the men to finish the work ?

5. A special train on the G. T. R., which travels at the uniform rate of 44 feet in a second, leaves Belleville for Toronto, a distance of 109 miles, at 8 o'clock a.m. ; at what time will the train reach Toronto ?

6. How many minutes must a boy who runs 6 miles an hour start before another boy who runs $7\frac{1}{2}$ miles an hour in order that they may be together at the end of 10 miles ?

7. A man on the average walks 10 feet 8 inches in 4 steps ; what number of steps will he take between two places a distance of 1 mile 1,280 yards apart ?

8. A bankrupt pays 59 cents on the dollar ; what will a man lose to whom he owes \$13,675 ?

9. Two boys start in a race, and one of them gains 5 feet upon the other in every 55 yards ; how much will he have gained at the end of half a mile ?

10. If a merchant marks his goods on credit 20% above cash price, what ready money will he take for an article marked \$26 ?

XXVI.

1. A can do $\frac{1}{2}$ of a piece of work in 1 hour, B can do $\frac{3}{4}$ of the remainder in 1 hour, and C can finish it in 20 minutes ; how long will it take A, B and C together to do the work ?

2. By selling tea at 96 cents a pound, a merchant gains $\frac{1}{7}$ of the cost ; he then raises the price to \$1.05 a pound ; what does he clear on every \$8.40 of his outlay by the latter price ?

3. A, B and C met ; A had 5 loaves, B had 3 loaves, and C had 40 cents ; they divided the loaves fairly, and C divided the money fairly between A and B ; how much money did each receive ?

4. How many bricks 9 inches long, $4\frac{1}{2}$ inches broad and 4 inches thick will be required for a wall 30 feet long, 20 feet high and 4 feet thick if the mortar make up $\frac{1}{16}$ of the entire wall ?

5. If it costs \$70.40 to carpet a room 24 feet long with carpet $2\frac{1}{4}$ feet wide at \$1.10 per yard, find the width of the room.

6. A can build 7 rods of fencing in a day, B can build 9 rods, and C 12 rods in a day ; what quantity of fencing would afford a number of full days' work for any one of the three ?

7. A boy spent $\frac{2}{3}$ of his money for a pair of skates and had 57 cents more left than he spent ; how much money had he at first ?

8. A quantity of tea was sold for \$1 a pound, the gain being $\frac{51}{100}$ of the cost price ; the total gain was \$57.60. How much tea was sold ?

9. A merchant sells 60 pounds of tea and coffee for \$43.50—the tea at 90 cents and the coffee at 40 cents per pound. How many pounds of each did he sell ?

10. The fore wheel of a wagon is 8 feet round, and the hind wheel 14 ; how many feet will the wagon travel over before each wheel shall have made a number of complete turns ?

XXVII.

1. Make out the following bill :

- 1,344 feet of lumber at \$1.62 $\frac{1}{2}$ per C ;
- 48,480 cubic feet of timber, at \$59.37 $\frac{1}{2}$ per M ;
- 7,400 cedar rails, at \$7.75 per C ;
- 8,400 fence-pickets, at \$15 per M ;
- 9,056 brick, at \$3 per C ;
- 5,680 pounds of hay, at \$12.50 per ton.

2. Find the cost of digging a cellar 36 feet long, 24 feet wide and 6 feet deep, at 24 cents per cubic yard.

3. What is the least number which when divided by 24 or 39 leaves 2 for remainder?

4. A man bought a certain number of cows for \$1,080; he sold half of them for \$810, thereby gaining \$15 on each one sold. What did each cost him?

5. If a person spends in 4 months as much as he earns in 3, how much can he lay by annually, supposing that he earns \$420 every 6 months?

6. A is to receive \$1.25 a day every day he works, and to forfeit 80 cents every day he is idle. At the end of 75 days his wages amount to \$69.15. How many days was he idle?

7. A clock which loses 4 minutes in 12 hours, is 10 minutes fast at midnight on Sunday. What o'clock will it indicate at 6 o'clock on Wednesday evening?

8. Find the interest on \$650 for $4\frac{1}{2}$ years at $5\frac{1}{2}\%$ per annum.

9. The Centre Road from Brampton to Orangeville is 4 rods wide and contains 176 acres. How many miles from Brampton to Orangeville, by way of the Centre Road?

10. Out of a purse I take \$100 more than $\frac{1}{2}$ of the whole sum which it contained; then \$30 more than $\frac{1}{5}$ of what then remained, and then \$20 more than $\frac{1}{4}$ of what then remained; after this \$10 remained. What did the purse contain at first?

XXVIII.

1. A certain piece of work can be done in 18 days by 4 men, 7 women or 9 boys; how long will the same work occupy 5 men, 4 women and 2 boys?

2. The hour and minute hands of a watch are together at 12 o'clock, when will they next be together?

3. A hare pursued by a greyhound was 130 yards before him at starting; while the hare ran 5 yards the dog ran 7 yards; how far had the hare gone when she was caught by the greyhound?

4. A dealer in cattle gave \$6,400 for a certain number, and sold a part of them for \$3,600 at \$18 each, and by so doing lost \$2 per head. For how much a head must he sell the remainder to gain \$800 on the whole?

5. Find the number from which if 13,675 be taken the remainder will be 45,209 less 27,645,

6. By what number must the product of the sum and difference of 8,376 and 5,684 be increased so that the result may be exactly divisible by 7,859?

7. A merchant failed and his goods were worth \$7,770. Out of this he can pay his creditors 37 cents on the dollar. Find the merchant's indebtedness.

8. A farmer sold 28 bushels of oats and 39 bushels of corn for \$36.04. He received for the corn 34 cents more per bushel than for the oats. What was the price of each per bushel?

9. How many pickets, each 3 inches wide, placed 3 inches apart, will be required to fence a lot 14 rods long and 6 rods wide, and what will be their cost at \$2.75 per C?

10. A school clock which gains 3 seconds in 5 hours was set correctly at 9 a.m. on Monday. How much too fast will it be at 4 p.m. on Friday?

XXIX.

1. The sum of two numbers is 9,650, and their difference is 5,798. What are the numbers?

2. By selling a horse for \$128 I lost \$40. What would I have gained had I sold him for \$200?

3. If 5 tons of coal are equal to 9 cords of wood, and a family burns 27 cords of wood in a year, how much will it save by changing from wood to coal, when wood is \$4.25 a cord and coal is \$6.80 a ton?

4. The product of two numbers is 1,270,374, and half of one of them is 3,129. What is the other?

5. A can dig 36 post-holes in a day, B can dig 32 and C 30 in the same time. What is the smallest number which will furnish exact days' labor, either for each working alone or for all working together?

6. Find the greatest number which will divide 10,974 and 15,336, leaving as remainders respectively 54 and 36.

7. A ship and her cargo are valued at \$60,000, and $\frac{3}{8}$ of the value of the ship is equal to $\frac{1}{4}$ of the value of the cargo. Find the value of each.

8. What number must be taken from $17\frac{1}{5}$ so that it may contain $3\frac{2}{5}$ an exact number of times?

9. Divide \$8,888 among A, B and C, so that A may receive \$88 less than 3 times B's share, and C \$176 more than one-half of A and B's shares together.

10. How many bushels of oats would be required to sow a field 32 rods long and 30 rods wide, sowing 2 bushels 1 peck to an acre?

XXX.

1. Four geese and 5 turkeys cost \$7.50. If 2 geese are worth as much as 5 chickens, and 4 turkeys worth as much as 12 chickens, find the cost of 5 pairs of chickens.

2. How many cords of wood can be piled in a shed 15 feet long, 12 feet wide, 9 feet high?

3. A mason charges 20 cents a square yard for plastering the walls and ceilings of 3 rooms. The first room is 10 feet long, 8 feet wide; the second, 12 feet long, 10 feet wide; the third, 18 feet long, 14 feet wide. Each room is 9 feet high. Find the total cost.

4. A farmer employed 6 men 20 days to do some ditching. After working 5 days he concluded to have the remainder finished in 10 days. How many additional men must he employ?

5. What is the least number which, if divided by either 8, 17, 20, 25 or 35, will leave a remainder 5 in each case?

6. Find the cost of wire, at 8 cents for 5 yards, for a barbed wire fence 6 wires high, to enclose a field 42 rods long and 35 rods wide.

7. Find the cost of the posts for a fence around a garden 250 yards by 220 yards, if the posts are placed 6 feet apart and cost 10 cents each.

8. How many feet of lumber are required for the upright boarding, if a close board fence 4 feet high above the 14-inch base is placed around the garden in No. 7?

9. One-fourth of $\frac{1}{3}$ of the length of a pole is in the mud; $\frac{2}{3}$ of the remainder is in the water and there are $5\frac{1}{2}$ feet in the air. What is the length of the pole?

10. John spent \$80 less than $\frac{2}{3}$ of his money at one time, and at another \$40 more than $\frac{2}{3}$ of the remainder, and now has \$40 left. How much had he at first?

XXXI.

1. How many 2-inch pickets placed 2 inches apart are required for a fence 40 rods long?

2. A farm laborer, who is to receive \$1.35 a day, begins work on Saturday, July 27th, and works until the evening of November 6th. How much should he receive?

3. How far will the horses travel in reaping a square 10-acre field with a reaper that cuts a 4-foot swath?

4. The estimated value of a school district is \$450,000. How many mills on the dollar will have to be levied to raise a tax sufficient for \$1,200 school expenses?

5. A farmer has two 10-acre fields. One is 80 rods long and the other 100 rods long. How many more yards of wire fence will be required for one than the other, the fence to be five wires high?

6. How many 7-acre fields in a square farm, each side of which is 280 rods?

7. What will it cost for the lumber to fence five miles of railway, both sides, with 6 6-inch boards at \$8 per M?

8. A man bought a horse for \$125 cash. He traded it for a yoke of oxen and gave \$12 into the bargain. One of the oxen died, and he sold the other for \$73. How much did he lose on the entire transaction?

6. A boy lives with a farmer for three years upon condition that he receives \$1 the first month, \$1.75 the second, \$2.50 the third, and so on until the end of his time. How much will his three years amount to?

10. A binder receives \$151 25 for working a certain number of days. If he had worked 11 days more he would have earned \$165. Find his daily wages.

XXXII.

1. A ton of coal lasts a family 14 days. If coal is worth \$6.25 a ton, what will their coal cost from October 1, 1885, until March 31, 1886, inclusive?

2. A farmer's horses, cattle and sheep together number 192. He has three times as many cattle as horses, and four times as many sheep as cattle. How many of each has he?

3. How many feet of lumber are required for a 12-inch base board around a field 40 rods by 30 rods?

4. Find the value of a pile of 12-foot lumber 8 feet high by 4 feet 7 inches wide, at \$21.30 per M.

5. If a street 5 miles long contains $30\frac{10}{33}$ acres, what is its width?

6. How many bricks 9 inches long and $4\frac{1}{2}$ inches wide will be required to pave a space 18 feet long by $12\frac{3}{4}$ feet wide?

7. The cost of a house and farm was \$18,750; the farm cost \$2,300 more than the house. Find the cost of each.

8. Make out the following bill:—1,020 pounds oats at 63 cents a bushel; 432 pounds barley at 70 cents a bushel; 40 pounds sugar at 8 pounds for \$1; 27 pounds tea at 4 pounds for \$2.60.

9. A piece of land is 300 rods long and 484 yards wide. How many acres in the piece?

10. In 25 days a man travelled 472 miles, 7 furlongs, 12 rods, travelling the same distance each day. How far did he travel in one day?

XXXIII.

1. How many posts are required to enclose a $\frac{1}{4}$ -acre lot of 56 feet frontage, if the posts are placed 6 feet apart?

2. How many feet of lumber in a tight board fence 5 feet high round a rectangular lot 132 feet by 66 feet?

3. Find the cost of 245 pounds of flour at \$6.60 per barrel.

4. Find the expense of carpeting a room 15 feet 9 inches long, and 13 feet 4 inches wide, with carpet 27 inches wide at 95 cents a yard.

5. At the rate of $124\frac{1}{2}$ rods a minute, how many hours will a train be in going from Boston to Buffalo, a distance of 498 miles?

6. What number must be added to 1,000,000 to make it exactly divisible by 492?

7. What number divided by 379 gives a quotient 9,734 and a remainder 57?

8. If I start on a bicycle for a place at 15 miles an hour, I am one hour too soon; but if I drive at 10 miles an hour I am 1 hour too late. How far is it?

9. If a clock gains $2\frac{1}{2}$ minutes a day, and it was exactly correct at 2 p.m., on October 16th, what time will it indicate at noon on Christmas day?

10. How many bricks 9 inches long, $4\frac{1}{2}$ inches wide and 4 inches thick will be required for a wall 60 feet long, 17 feet high and 4 feet thick, allowing nothing for mortar?

XXXIV.

1. I have a cask full of milk. I draw out $\frac{1}{4}$ of it and fill it up with water; I draw out $\frac{1}{4}$ of this and again fill it up with water; I do this altogether 4 times. If the milk now were separated from the water, how much of the cask would it fill?

2. What length of road 36 feet wide will contain an acre?

3. The product of three numbers is 443,398, one of the numbers is 47 and another 89. What is the third number?

4. How many sods, each 1 foot 8 inches by 10 inches, will it take to sod a $\frac{1}{4}$ acre plot?

5. Of what number is 17 ten less than its half?

6. A quantity of coffee has chicory added to it, so that chicory is $\frac{1}{9}$ of the whole mixture. If the mixture be worth 48 cents a pound, and the chicory 8 cents a pound, what is the exact value of a pound of pure coffee?

7. A man owning a farm of 168 acres divided it into 14 equal parts, 11 of which he sold; he then divided what he had left into 9 equal parts, 5 of which he sold. Find the value of what he still owns at \$50 an acre.

8. A boy gave 75 cents more than $\frac{2}{3}$ of his money for a book and had \$2.40 left. How much had he at first?

9. A watch gains as much as a clock loses, and 1,799 hours by the clock are equivalent to 1,801 hours by the watch. Find how much the watch gains and the clock loses per hour.

10. A train passes a telegraph post every 15 seconds; the posts are 20 rods apart. How many miles an hour is the train running?

XXXV.

1. A dealer in horses gave \$5,920 for a certain number, and sold a part of them for \$2,700 at \$75 each, thus losing \$5 on each. For how much each must he sell the remainder to gain \$428 on the whole transaction?

2. A and B ran a race which lasted 5 minutes, B had a start of 20 yards; but A ran 3 yards while B was running 2 and won by 30 yards. Find the length of the course.

3. If 8 gold coins and 9 silver coins are worth as much as 6 gold coins and 19 silver ones, express a gold coin in terms of a silver coin.

4. How much per dozen is $87\frac{1}{2}$ cents per pair.

5. A field of hay 40 rods long and 20 rods wide averages 1 ton 1,400 pounds to the acre. What is the hay worth at \$9.60 a ton?

6. A drover bought cattle, hogs and sheep; the hogs cost on the average half as much as the cattle and four times as much as the sheep. He paid \$36.75 for 7 sheep. Find the total cost of 7 sheep, 23 cattle and 48 hogs.

7. A pile of 4-foot wood is 33 feet long and 5 feet high. How much is it worth at \$3.84 per cord?

8. The sum of two numbers is 1,415; the greater one of the two is 817; divide the product of these two numbers (that, added together, make 1,415) by their difference.

9. From what number must I take 8 more than its half to leave 30?

10. A person bought a certain number of eggs, half of them at 2 a penny and half of them at 3 a penny. He sold them again at the rate of 5 for two pence, and lost a penny by the transaction. What was the number of eggs?

XXXVI.

1. How many feet of lumber are there in 100 pieces of 14 foot siding 6 inches wide?

2. A man rows 30 miles and back in 12 hours, and he finds that he can row 5 miles with the stream in the same time as 3 against it. Find the time of rowing up and down.

3. 689 is contained in a certain dividend 437 times and leaves a remainder of 469. If 690 be added to the dividend what will the quotient and remainder then be?

4. If I walk to a train, I am $\frac{1}{4}$ of an hour too late; but if I ride at 3 times the rate, I am 5 minutes too soon. How far is it, if I can walk 3 miles an hour?

5. Of what number is 14 greater by 3 than its third?

6. How many miles an hour does a person walk who takes 2 steps a second and 1,800 steps a mile?

7. Find the largest number that will divide 3,791 with a remainder 17, and 5,232 with a remainder 15.

8. A fruit merchant expended \$523.60 in purchasing apples; he sold them at \$4.92 a barrel, gaining \$1.07 per barrel. What was his gain on this transaction?

9. Find a number whose $\frac{1}{6}$ part is 7 greater than its $\frac{1}{7}$.

10. If I take from a cask 1 gallon less than $\frac{1}{2}$, and then 1 gallon less than $\frac{1}{3}$ of what remains, and, lastly, 1 gallon less than $\frac{1}{4}$ of what remains, and find that I have still $12\frac{1}{4}$ gallons left, what did it contain at first?

XXXVII.

1. If a man can row 3 miles an hour against a stream, the rate of which is $2\frac{1}{2}$ miles an hour, how far will he row in $3\frac{1}{2}$ hours with the stream?

2. With what quantity of spirits, worth \$3.60 a gallon, must $3\frac{1}{2}$ gallons of water be mixed to reduce the price per gallon to \$3.20?

3. How many boards 12 feet long will it take to fence a field 60 yards long and 40 yards wide, supposing the fence to be 5 boards high?

4. A farmer sold 50 bushels of wheat, and with $\frac{2}{3}$ of the price of it bought 5 bushels of timothy seed at \$2 a bush, 4 bushels clover at \$3.50 a bushel, 4 pounds tea at 63 $\frac{1}{2}$ cents a pound and 35 yards cotton at 10 cents a yard. How much did he get for his wheat?

5. How many apples must be cut up to give 20 boys $\frac{2}{3}$ of an apple each?

6. How many 2-inch pickets, placed 2 inches apart, will fence a $\frac{1}{4}$ -acre lot of 66 feet frontage?

7. A man bought 63 sheep, and sold $\frac{4}{9}$ of them at a profit of 15%, $\frac{1}{7}$ at a profit of 50% and the remainder at a loss of 25%. What did he pay for the sheep, if his gain was \$18.48 on the whole transaction?

8. If 8 horses plough 11 $\frac{2}{3}$ acres in 2 days, in how many days should 6 horses plough 17 $\frac{1}{2}$ acres?

9. How much tea at 96 cents a pound must be mixed with tea at \$1.20 a pound so as to form a mixture of 180 pounds in which the value of the different teas is equal?

10. Divide 17 into two parts so that 6 times the greater part is 2 less than 7 times the smaller part.

XXXVIII.

1. If the large wheel of a bicycle is 18 feet 4 inches in circumference, and the smaller one 4 feet 2 inches, how often do the same spots touch the ground at the same moment in 5 miles?

2. A railway train leaves Edinburgh at 9 for London (405 miles) at 66 feet per second; when will it meet the train which left London at 10, travelling at the rate of 1,320 yards a minute?

3. Find the cost of seeding 14 acres of oats at 40 cents a bushel, if 75 pounds are sown to the acre.

4. A man earns \$2.50 a day. How much will he earn in the month of May, the first day of which was Saturday?

5. A farmer purchases 749 sheep and sells 700 of them for the price he paid for the whole, and afterwards sells the remaining sheep at the same price per head as the others. Find the gain per cent.

6. Two-foot wood is piled to the height of 6 feet. How long must the pile be to contain 3 cords?

7. A man sells a piece of land 8 rods long and 6 rods wide at \$120 an acre, but throws off $\frac{1}{20}$ of the price for cash. How much should he receive?

8. 3 horses are worth as much as 10 cows, and 3 cows as much as 14 sheep. If a sheep be worth \$7.50, find the value of 2 horses, 4 cows and 6 sheep.

9. A owes B a bill of \$42.80. He pays the debt partly with wood and partly with cash. The wood is twenty-eight feet long, 5 feet high, and 4 feet long, and is worth \$2.62 $\frac{1}{2}$ a cord. What sum in cash will settle the bill?

10. A hare is 200 of her own paces in front of a greyhound. If 2 of the greyhound's paces are equal to 3 of the hare's, and she only takes 3 while the greyhound takes 4, in how many of the hare's paces will he overtake her?

XXXIX.

1. How long will it take a man to walk round a square field, the area of which is 5 $\frac{5}{8}$ acres, at the rate of a mile in 10 $\frac{3}{4}$ minutes?

2. A footpath goes up the side and then along the end of a rectangular field, 216 yards long and 195 broad; what distance will be saved by cutting across in the direction of the diagonal?

3. 2 cwt., 3 qrs., 15 lbs., is taken 6 times from a certain number, and the remainder contains 2 qrs., 1 lb., 7 times. Find the number in pounds.

4. What is the least number added to 7, 869, 456, that will make it exactly divisible by 8,975?

5. If in a certain country, farms of 200 acres have a road frontage of 220 yards, how far back do they extend?

6. The area of a county containing 100,000 acres covers 5 square inches on a map. What is the scale by which the map is drawn?

7. The cost price of a book is \$4.75, expense of the sale 6%, profit 24%; what is the retail price?

8. A and B walk a race of 25 miles; A gives B 45 minutes start; A walks uniformly a mile in 11 minutes, and catches B at the end of 20 miles; find B's rate, and by how much he lost in space.

9. A and B receive \$1.37 $\frac{1}{2}$ for digging a garden. They work at it together for 4 $\frac{1}{2}$ hours; B then left, and A finished the work in 3 $\frac{1}{2}$ hours. How should the pay be divided?

10. In how many years will \$320 double itself, at 7 $\frac{1}{2}$ % per annum, simple interest?

XL.

1. A watch which gains 3 minutes 12 seconds a day is put right at noon on Monday; what time will it indicate at 3 p.m. on the following Tuesday?

2. 2,370 men have provisions for 57 days, and after 17 days 120 men go away ; how long will the remaining provisions last the men who are left ?

3. The wages of A and B together for $22\frac{1}{2}$ days amount to the same sum as the wages of A alone for $38\frac{1}{4}$ days. For how many days will this sum pay the wages of B alone ?

4. A cistern is fed by a spout which can fill it in 4 hours ; how long would it take to fill it, if the cistern has a leak which would empty it in 17 hours ?

5. A person spends $\frac{3}{8}$ of his money for dry goods, $\frac{3}{7}$ of the remainder for groceries, and has \$15 left. How much had he at first?

6. In rolling a grass plot 24 yards long and containing 400 sq. yards, how many times must a roller 3 ft. 4 in. wide be drawn over it lengthwise so that the whole may be rolled ?

7. How many sods, each 2 feet $3\frac{1}{2}$ inches long, and $8\frac{1}{4}$ inches broad would be required to turf an acre of ground ?

8. A can beat B by 20 yards in a mile race, B can beat C by 20 yards in a mile race ; how many yards start can A give C that there may be a dead heat ?

9. A train going 25 miles an hour leaves Bristol at 1 p.m. for London (120 miles), another, going 30 miles an hour, leaves London for Bristol at 2.12 p.m. ; when and where will they meet ?

10. A and B working together do a piece of work in 7 days ; B alone can do it in 13 days ; supposing B works at it for 3 days, in how many days could A alone finish it?

XLI.

1. After a certain number of men had been employed on a certain work for 24 days and had half finished it, 16 more were put on, and the remaining half was completed in 16 days ; how many men were employed at first ?

2. One vessel contains 24 gallons of water, another 12 gallons of wine ; one gallon is taken from each and then poured into the other; this is done twice ; how much wine and how much water will the vessels then contain ?

3. Divide \$111 among A, B and C, so that A may have \$1 less than B, and twice as much as C.

4. A and B have equal sums of money, A gains \$250, B loses \$95, and then A has twice as much as B. How much had each at first ?

5. In a division the majority was 108, which was $\frac{2}{13}$ of the whole number of votes, how many voted on each side ?

6. One-eleventh of a farm is worth \$19.80 more than $\frac{1}{12}$ of it. Find the value of $\frac{2}{5}$ of the farm.

7. In a mile race A gives B 100 yards start, and beats him by 20 yards. If B can run the mile in 5 min. 8 sec., how long did A take?

8. A man went $\frac{4}{5}$ of a journey by train, $\frac{5}{8}$ of the remainder by coach, and walked the last 3 miles; how long was the journey?

9. One man takes 120 steps a minute, each 30 inches long; another walks $3\frac{1}{3}$ miles an hour; if they start together, how soon will one of them be 100 yards ahead of the other?

10. A soldier has 5 hours' leave of absence; how far may he ride on a coach which travels 10 miles an hour, so as to return to the camp in time, walking at the rate of 5 miles an hour?

XLII.

1. If I can walk a certain distance in 114 days when I rest 5 hours each day, how long will it take me to walk twice as far if I walk twice as fast and rest twice as long each day?

2. A starts business with a capital of \$8,000, and after six months admits a partner B with a capital of \$7,000. The profits at the end of the year are \$943; what is the share of each?

3. A runs $6\frac{2}{3}$ yards while B runs 7 yards; B runs $16\frac{1}{2}$ yards while C runs 15 yards; if A can run a mile in 5 min. 15 sec., what time will C take to do it?

4. Two men can do half a piece of work in 5 days, and then one alone finishes it in 8 days. How long would the other man alone take to do the whole work?

5. An engine running at the rate of 48 miles an hour, runs $6\frac{2}{3}\%$ faster than usual; what is the usual speed?

6. What is the cost of painting both sides of a fence 4 feet high, enclosing a field 20 rods long and 90 feet wide, at 27 cents a square yard?

7. A merchant sent to an agent \$3,895 to invest in tea, at 76 cents a pound, after deducting his commission of $2\frac{1}{2}\%$, how many pounds of tea did he buy?

8. A person insured his house for $\frac{4}{5}$ of its value at 80 cents per \$100, paying a premium of \$64.60. What was the value of the house?

9. A piece of cord 143 feet long, is cut into 2 pieces so that $\frac{5}{9}$ of the shorter is equal to $\frac{7}{8}$ of the longer. Find the length of each piece.

10. A lawn which is twice as long as it is broad contains $840\frac{1}{2}$ sq. yards. Find its length and breadth.

XLIII.

1. In a battle 8% of the army were killed and 10% of the remainder mortally wounded ; the difference between killed and wounded was 915. How many were there in the army ?

2. A man lost $\frac{3}{10}$ of his capital in a certain speculation, after which he gained \$550, he then had \$6,885 ; how much did he lose ?

3. A boy hired with a farmer for 40 weeks for \$40, and a suit of clothes, at the end of 24 weeks he gave up his situation and received \$18 and the suit. Find the value of the suit.

4. A man rows 10 miles in $2\frac{1}{2}$ hours against the stream, the rate of which is three miles an hour ; how long will he be in rowing 5 miles with the stream ?

5. Three men working all day can plant a field in 10 days, but one of them having other employment can work only half time ; how long will it take them to complete the work ?

6. A man would lose $17\frac{1}{2}\%$ by selling a house for \$5,775 ; what price must he ask in order to gain 15% ?

7. On a certain line of railway the telegraph posts are placed 58 yards apart, and a passenger counts as he passes 37 posts in 2 minutes ; at what rate is the train moving ?

8. A man walks to town at the rate of $3\frac{3}{4}$ miles per hour, rests there $\frac{1}{2}$ an hour, and rides back at the rate of $7\frac{1}{4}$ miles an hour ; how far has he walked, the whole time occupied being 4 hours 10 minutes ?

9. A square grass field whose side is 123 yards has a gravel path $4\frac{1}{2}$ feet wide round the edge and inside the field ; find the area of the grass.

10. A starts to walk 30 miles at the rate of 4 miles an hour ; B follows from the same place half an hour afterwards and comes in at the same moment ; at what pace does B walk ?

XLIV.

1. A merchant bought a number of barrels of choice apples for \$3,000 ; he sets aside 40 barrels for his own use, and for $\frac{2}{5}$ of the remainder he receives \$1,794 which was \$138 more than their cost ; how many barrels did he buy ?

2. If 32 eggs be sold for 40 cents, and the gain at this rate be $\frac{2}{13}$ of the cost, find the cost price per dozen.

3. What is the value of a farm 150 rods long, and $94\frac{3}{4}$ rods wide, at \$40 per acre ?

4. A merchant has cloth marked at \$2.60, what did it cost him per yard, if at this price he can give a discount of 20%, and still make a profit of $33\frac{1}{3}\%$?

5. Water which weighs 1,000 ounces to the cubic foot, expands $\frac{1}{10}$ in freezing. How many tons of ice can be packed in a building 40 feet long, 30 feet wide and 22 feet high?

6. A sets out walking at $2\frac{1}{4}$ miles per hour along a straight road, and when he has gone 8 miles B starts after him at $3\frac{1}{4}$ miles per hour; when and where will he overtake him?

7. One clock gains 2 minutes in 3 days, another loses 6 minutes in 6 days, if they are set right at 12 o'clock to-day, when will their times differ by a quarter of an hour?

8. One boy runs 300 yards, and another 285 yards in one minute; how many yards start must the second have so that they may run a dead heat in a mile race?

9. What is the least sum of money which when divided equally among 20, 25, 36 or 48 persons leaves 50 cents over in each case?

10. Thirty-five times a man's weight is greater than thirty times his weight by 800 pounds; find his weight.

XLV.

1. A roller is 10 feet long, and 12 feet in circumference; how many times will it turn in rolling a field of 9 acres?

2. A speculator sold 24 town lots at \$250 each; on one half of these he gained 25% of cost, and on the other half he lost 25% of cost. Find the gain or loss on the whole transaction.

3. How many thousand feet of boards will it require to put a fence 8 feet high round a 10 acre field 242 yards long?

4. By selling a horse for \$140 I lose 30%. For how much must I sell him to gain 5%?

5. I pay \$100 for a carpet $\frac{3}{4}$ yard wide, and it just covers a room 30 feet long by 27 feet wide. Find the length of the carpet and the price per yard.

6. If a man can do a job of work in 4 days, and a boy can do $\frac{1}{10}$ as much in $\frac{1}{2}$ of the time, in what time can they do it working together?

7. The price of butter per pound is just double the price of eggs per dozen, and it costs \$3.78 to buy 14 dozen eggs and 14 pounds of butter. Find the selling price of each.

8. A telegraph line, measuring from the first pole to the last one, is 27 miles 5 furlong, 187 yards long ; the poles are 99 yards apart ; how many are there ?

9. A borrows \$3,205 on the 3rd of May, and on the 15th July the interest due is \$96.15. At what rate did he borrow ?

10. A stock of goods cost \$300, and freight 5% additional. If 40% of the goods be sold at a profit of 27% and the remainder at 25%, what is the gain ?

XLVI.

1. A spirit merchant buys 75 gallons at \$3.25 a gallon, and drawing off 10 gallons, sells the remainder so as to gain 5% on the whole. What is the selling price per gallon ?

2. Coffee is bought at 25 cents a pound, and chicory at 10 cents a pound ; in what proportion must they be mixed that 10% may be gained by selling the mixture at 15 cents a pound ?

3. A telegraph pole is 22 feet long and the part in the ground is $\frac{2}{11}$ of the whole length. How far is the top of the pole from the ground ?

4. How many yards of silk $\frac{5}{8}$ of a yard wide will be required to line 24 yards of satin $\frac{3}{4}$ of a yard wide ?

5. At what price per pound must a grocer sell sugar which cost him \$15.40 per hundred weight, so that on every \$44 of outlay he may gain the cost price of 80 pounds ?

6. If eggs sold at the rate of 35 for 48 cents, and the gain at this rate is $\frac{1}{5}$ of the outlay, find at what rate per dozen they were purchased.

7. How many gallons of water must be added to 63 gallons of alcohol, worth \$4.40 a gallon, in order that it may be sold at \$3.60 a gallon without loss ?

8. A can do a piece of work in 5 days, B in 6, and C in 8. If A and B work at it two days each, how long will it take B and C to finish it ?

9. If it costs \$48 to carpet a floor 24 feet long by 18 feet wide with carpet 27 inches wide, find the price of the carpet per yard.

10. The dividend decreased by 13 is equal to 33 times the remainder ; the difference between the remainder and divisor is 9 ; the quotient is 21. Find the divisor, dividend and remainder.

XLVII.

1. Two boys run a mile race ; one of them gains 5 feet in every 110 yards. How far will the other be left behind at the end of the race ?

2. A merchant's cash price is 10% above cost, and his credit price is 5% above his cash price. If the cash price of an article is \$8.80, find the cost and credit prices.

3. A watch which gains 90 seconds in 14 hours marks the correct time at the beginning of the week. What will be the correct time when it marks the end of the week ?

4. Two trains start from the same station, one 2 hours ahead of the other ; their respective rates are 25 and 30 miles per hour ; the faster train arrives 1 hour before the slower. Find the distance travelled.

5. If A can do $\frac{3}{5}$ of a piece of work in $2\frac{1}{4}$ days, and B can do $\frac{5}{6}$ of the same work in $3\frac{3}{4}$ days, how long will it take A and B working together to do it ?

6. A boy gives $\frac{1}{2}$ of his marbles to A, $\frac{1}{3}$ to B and the rest to C ; C loses 20 and has then 70 less than A. How many had each at first ?

7. If 10 men can do a piece of work in 12 days, how soon after beginning must they be joined by 3 more so as to finish the work in 10 days ?

8. By selling a house for \$3,700 I lost $7\frac{1}{2}\%$. What must I have sold it for to have gained $12\frac{1}{2}\%$?

9. If 12 men or 18 boys can do $\frac{3}{4}$ of a piece of work in $6\frac{1}{2}$ hours, in what time will 11 men and 9 boys do the rest ?

10. A man rows down a river 18 miles in 4 hours with the stream, and returns in 12 hours. Find the rate at which he rows.

XLVIII.

1. A boy paid 3 cents each for oranges and had 9 cents left ; had he paid $3\frac{1}{2}$ cents he would have been 9 cents short. Find the number of oranges bought.

2. A train 45 rods long, running at the rate of 32 miles an hour, takes 36 seconds to cross a bridge. Find the length of the bridge.

3. A drover bought a certain number of sheep for \$960 ; fifteen of them died ; he sold $\frac{2}{3}$ of the remainder for \$735, which was \$175 more than they cost. How many sheep did he buy ?

4. A book is $3\frac{1}{2}$ inches thick. Each cover is $\frac{3}{16}$ of an inch thick, and the book contains 904 pages. What is the thickness of each leaf?

5. A grocer mixes 40 pounds of tea at 60 cents per pound with 65 pounds at 72 cents per pound. At what price per pound must he sell the mixture to gain 25% of the cost?

6. How much water must be mixed with 100 gallons of vinegar at 60 cents a gallon, to reduce the value to 50 cents a gallon?

7. A customer bought what he supposed was \$48 worth of tea, but a false weight having been used, he got only \$42 worth. How many ounces were given for a pound?

8. A and B run a race of 200 yards, and A wins by 3 yards. A and C run over the same course and C wins by 2 yards. What start can C afford to give B in a 200 yards race?

9. I bought 10 pounds of tea and 12 pounds of coffee for \$8.40. The tea was 40 cents dearer a pound than the coffee. Find the price of each per pound.

10. By selling 175 yards of cloth at \$1.50 a yard, a merchant gains \$10.50 more than twice as much as he would have lost had he sold it for \$1.20 a yard. Find the cost price per yard.

XLIX.

1. A merchant bought a piece of cloth for \$72. He kept 25 yards for his own use, and sold the rest at an advance of 10% on cost, receiving for it \$57.20. What did the cloth cost him per yard?

2. A farm contains 120 acres; its width is $\frac{3}{4}$ of its length; find its length in yards.

3. A piece of cloth would be worth \$65 if it were $\frac{1}{2}$ longer. If the price of a yard be \$1.25, how many yards in the piece?

4. How far may a person ride in a carriage going at the rate of 8 miles per hour so that if he walked back at the rate of 3 miles per hour he may be gone $5\frac{1}{2}$ hours?

5. Walking $4\frac{1}{4}$ miles an hour, I start after a friend whose pace is 3 miles an hour, how long shall I be in overtaking him if he has a start of 2 hours?

6. Bought a piece of cloth for \$12.96. There were as many yards in the piece as it cost cents per yard. How many yards did I buy?

7. A can run 8 yards while B runs $7\frac{1}{2}$. How much of a start should be given to B in a quarter mile race in order that neither may win?

8. The wages of A and B together for $7\frac{1}{2}$ days will pay the wages of A alone for 20 days. For how many days will this sum pay the wages of B alone?

9. A sold B a carriage which cost him \$150 at $12\frac{1}{2}\%$ profit. B sold it to C at a profit of 10%. What would have been A's profit per cent if he had sold to C for the price C paid?

10. By using false weights a grocer receives 33 cents instead of 32 cents. Find the number of ounces in his false pound.

L.

1. A man has \$260, he spends a certain sum and afterwards gains 6 times what he spent; he then had \$405. Find how much he spent.

2. A grocer bought a quantity of potatoes for \$250; he sold half of them for \$150, gaining 8 cents a bushel on what he sold. What did the potatoes cost him per bushel?

3. A mixture of black and green tea weighing 16 pounds is worth \$7.75. If the proportions of each are interchanged the mixture will be worth \$7.45. The black tea is worth 40 cents a pound. Find the price of the green tea.

4. A man bought 80 barrels of flour for \$427.50, paying \$5.40 for first quality, and \$5.25 for second quality. How many barrels of second quality did he get?

5. A merchant buys cotton, and sells it at a profit of $\frac{1}{4}$ of the cost. Find the cost per yard if the selling price of 150 yards is equal to the profit on \$60 outlay.

6. A train 120 yards long, moving at the rate of 40 miles an hour, meets another train moving at the rate of 30 miles an hour and passes it in $6\frac{3}{2}$ seconds. Find the length of the last train.

7. A vessel contains 4 parts alcohol to 3 parts of water. How much of the mixture must be drawn off and replaced by water that the new mixture may be half and half?

8. Divide \$2,000 among A, B and C, so that A may have \$30 more than B, and 3 times as much as C.

9. A man hired for a year and was to receive \$156 and 7 cords of wood. He left at the end of 8 months and received \$93.50 and the wood. Find the price of the wood per cord.

10. A man employs 9 men and a certain number of boys; he pays the men \$1.25 a day and the boys 75 cents a day; the amount he paid to all was as much as if each had received \$1.05 a day. How many boys were employed?

LI.

1. What sum of money will amount to \$426.56 $\frac{1}{4}$ in 6 years 3 months at 5% per annum ?

2. If a man can do a certain work in 1 $\frac{1}{2}$ days and a boy can do it in 4 days, how much of the work will be left undone after both have worked together at it for one-half of a day ?

3. A man divided a farm among three sons ; to the first he gave 80 acres, to the second $\frac{4}{9}$ of the whole and to the third $\frac{3}{4}$ as much as to both the others. How many acres did the farm contain ?

4. Sold 20,900 feet of lumber for \$331.62 $\frac{1}{2}$, gaining thereby \$78.37 $\frac{1}{2}$. What did it cost per C ?

5. The cost of carpeting a floor 10 $\frac{1}{2}$ yards long with carpet 27 inches wide, and costing \$1.35 a yard, was \$93.15 ; find the width of the room.

6. A grocer mixes 60 pounds of tea at 65 cents a pound with 80 pounds at 60 cents a pound ; at what rate per pound must he sell the mixture to gain 30% ?

7. A bankrupt owes four creditors as follows : A, \$2,500 ; B, \$3,300 ; C, \$4,200, and D, \$4,000 ; his property is worth \$10,500. What does each creditor receive ?

8. Find the expense of plastering a room 20 feet long, 18 $\frac{1}{4}$ wide and 11 $\frac{1}{8}$ feet high at 18 cents a square yard.

9. If A can do a piece of work in $\frac{1}{4}$ of an hour, and B in $\frac{1}{5}$ of an hour, how long will it take both working together to do it ?

10. If by selling an article for \$2 I gain 20%, for how much must I sell it to gain 33 $\frac{1}{3}$ % ?

LII.

1. How much water must be mixed with 600 gallons wine, at \$2.50 a gallon, in order to make the mixture worth \$2 per gallon ?

2. A railway company pays \$24.75 per acre for a portion of road 100 miles long and 94 $\frac{1}{2}$ feet wide, find the whole amount paid.

3. A merchant bought 27 pieces of cloth, each containing 19 $\frac{1}{3}$ yards, at \$4.31 $\frac{1}{4}$ a yard, and paid freight \$9.62 $\frac{1}{2}$; he sold so as to gain \$381.87 $\frac{1}{2}$. At what price per yard was the cloth sold ?

4. A sum of money amounts to \$787.50 in 10 years at 7 $\frac{1}{2}$ %. In how many years will it amount to \$990 ?

5. A bankrupt can pay 40 cents on the \$; if his assets were \$500 more he could pay 45 cents. Find his debts and his assets.

6. A man walks a certain distance, and rides back in 3 hours 45 minutes ; he could ride both ways in $2\frac{1}{2}$ hours. How long would it take him to walk both ways ?

7. A post 5 feet high casts a shadow 3 feet long ; at the same moment a certain tree casts a shadow 90 feet long. Find the height of the tree.

8. Find the cost, at \$16.00 a thousand feet, of the lumber for a side-walk $\frac{1}{2}$ a mile long and 6 feet wide, the lumber being 2 inches thick.

9. If 3 men or 5 boys can do a piece of work in 17 days ; in how many days will 5 men and 3 boys do a piece of work three times as great ?

10. It costs \$96.25 to carpet a room 22 feet 6 inches long, with carpet 27 inches wide at \$1.75 a yard. Find the width of the room.

LIII.

1. A bankrupt who is paying $37\frac{1}{2}$ cents in the dollar, divides among his creditors \$6,300. What do his debts amount to ?

2. A man bought a number of barrels of flour for \$1,800; he used 20 barrels and sold $\frac{4}{5}$ of the remainder for \$1,568, which was \$224 more than cost. How many barrels did he buy ?

3. At what rate per cent. will \$1,520 amount to \$1,733.75 in $2\frac{1}{4}$ years ?

4. A boy takes 924 steps of $2\frac{1}{2}$ feet each to walk round a field 40 rods long. How many acres in the field ?

5. What must be the width of a box 6 feet long, 4 feet high, to contain $\frac{3}{4}$ of a cord of wood ?

6. If a man rows 10 miles in $2\frac{1}{2}$ hours against a stream, the rate of which is 3 miles an hour, how long will he be rowing 5 miles with the stream ?

7. A grocer received pay at 72 cents a pound for what he supposed to be $5\frac{1}{2}$ pounds of tea. His pound weight was one-half an ounce too heavy. How much money should he have received ?

8. Find in what time \$33.40 will double itself at $6\frac{2}{3}\%$ per annum.

9. A can run 10 yards to B's 9. How many yards' start must A give B to make an even race in 100 yards ?

10. A merchant sells 90 pounds of tea and coffee for \$76, the tea at 90 cents and the coffee at 40 cents per pound. How many pounds of each did he sell ?

LIV.

1. A grocer in selling goods sells $15\frac{3}{4}$ ounces for a pound; how much does he cheat a customer who buys to the amount of \$40?

2. A crew can row down stream a distance of 4 miles in 30 minutes, and up stream the same distance in $34\frac{1}{2}$ minutes. Find the rate of the stream.

3. I sold 250 yards of cloth for \$345, receiving \$1.30 a yard for part of it, and \$1.50 a yard for the remainder. How many yards did I sell at each rate?

4. The whole time occupied by a train 176 yards long, going at the rate of 20 miles an hour in crossing a bridge is 25 seconds. Find the length of the bridge.

5. Bought \$64 worth of apples at 80 cents a bushel, part of which, being damaged and rendered worthless, I sold the remainder at an advance of 50%, receiving \$76.80. How many bushels were damaged?

6. A and B together can do a piece of work in $6\frac{1}{5}$ days; A can do it in 9 days. How long would it take B to do it?

7. Bought wheat at 95 cents a bushel, and sold it at \$1.10; find my gain per cent.

8. A ship with its cargo is worth \$260,000; $\frac{2}{5}$ of the cargo is worth $\frac{1}{3}$ of the ship. Find the value of the cargo.

9. A book was sold for 30% more than it cost. The sum of the buying price and selling price is \$4.60. Find the buying price.

10. A man spent 12% of his money, and had \$76 more than 50% of it left. How much had he at first?

LV.

1. A man sold a horse at a gain of 40%, and, with the money, bought another horse, which he sold for \$126, losing 10%. Find the cost of the first horse.

2. At \$2.25 a rod, what will it cost to fence a field $42\frac{1}{2}$ rods long and $137\frac{1}{2}$ yards wide?

3. If 7 pounds of flour are worth 10 pounds of pork, how much are 10 barrels of pork worth, if the price of the flour is \$5.60 a barrel?

4. A certain sum of money for a given time at 8% per annum amounts to \$710.40, and at 6% for the same time to \$652.80. Find the principal and time.

5. By selling goods at 40 cents a pound 20% is lost. What advance must be made in the price to gain $33\frac{1}{3}\%$ on the cost?

6. A rectangular field 300 yards long and 150 broad, is separated into 4 equal parts by 2 bands of trees, 20 yards wide, parallel to the sides. How large will each part be?

7. How many stones, each 2 feet long and $15\frac{1}{2}$ inches wide, would be required to pave a square courtyard whose side is 124 feet?

8. What weight of water will a rectangular cistern contain, the length being 5 feet, the breadth $3\frac{1}{2}$ feet, and the depth 12 feet?

9. A bridge 132 yards long and 18 feet wide is covered with plank $2\frac{1}{2}$ inches thick. Find the value of the plank at \$18.50 a thousand.

10. How many gallons of water must be mixed with $29\frac{1}{2}$ gallons of wine that the mixture may contain $17\frac{1}{2}\%$ of water?

LVI.

1. I bought 60 pounds of tea for \$35 and sold it so as to gain \$5.20; had I purchased \$105 worth of tea and sold it at the same price, what profit would I have made?

2. A farmer sold a load of hay at \$14.00 a ton; the whole weight of the wagon and hay was 2,650 pounds; the wagon alone weighed 900 pounds. How much did the farmer receive for the hay?

3. At what time are the hands of a clock exactly 3 minute spaces apart between 1 and 2 o'clock?

4. A cistern has 3 pipes; the first will fill it in 8 hours, the second in 10 hours, and the third will empty it in 14 hours. If all are opened, in what time will the cistern be full?

5. Bought oranges at 15 cents a dozen and sold them at 3 for 5 cents. How much did I gain on 12 boxes, each containing 25 dozen?

6. How many minutes from 2.35 p.m. Saturday until 8.43 a.m. Monday?

7. If, by selling goods for 15% profit, a merchant clears \$250, what was the cost of the goods?

8. A field containing 6 acres is 40 rods long. How many trees, 16 feet apart, will be required to plant it around?

9. What would a dishonest dealer gain per cent. by using $14\frac{3}{4}$ ounces instead of a pound?

10. A real estate agent sells a house for \$8,600 at $2\frac{1}{2}\%$. What is his commission for selling?

LVII.

1. A plate of brass 4 feet long, $2\frac{1}{2}$ feet wide, and $\frac{1}{2}$ an inch thick, is rolled into a sheet 7 feet long and 5 feet wide. Find its thickness.

2. A bar of iron 6 feet long and an inch square weighs 65 pounds. Find the weight of one the same length and $1\frac{1}{4}$ inches square.

3. Find the cost of a farm 1 mile long and 80 rods wide at \$60 an acre.

4. A farmer buys a plough at \$14 from an agent, who makes \$4 by the sale. Find what rate per cent. of profit the agent has.

5. Five pounds of tea at 60 cents are mixed with 4 pounds at 50 cents. At what price per pound must the mixture be sold to give a gain of $\frac{2}{5}$ of the outlay?

6. A, B and C met. A had 3 loaves of bread, B 2 loaves, and C 25 cents. The loaves were divided equally among the three; how should the money be divided?

7. The C.P.R. Company purchase a road 4 rods wide at \$75 an acre across a man's farm, which is 80 rods wide. How much does the man get for his land?

8. What will it cost to insure a mill worth \$18,000 for $\frac{2}{3}$ of its value at $1\frac{3}{4}\%$?

9. A company charges \$27.75 for insuring a house for \$1,850. What was the rate of insurance?

10. How long must the side of a square lot be to contain $5\frac{1}{2}$ acres?

LVIII.

1. What is the premium for insuring a cargo, valued at \$15,500, at $2\frac{1}{2}\%$?

2. A trader gets 500 barrels of flour insured for 75% of its cost at $2\frac{1}{5}\%$, paying \$80.85 premium. At what price per barrel did he purchase the flour?

3. What sum should be insured at 4%, on goods worth \$2,940, that the owner may receive, in case of loss, the value both of goods and premium?

4. An estate agent sells 420 acres of land at \$18.50 an acre, and charges $2\frac{1}{4}\%$ commission. What is his commission?

5. My real estate is assessed at \$2,150. The rate of taxation for a certain year is 11 mills on the dollar. What taxes have I to pay?

6. A lawyer collected a note of \$250; how much should he pay the owner of the note, his commission being 6%?

7. At what rate must property valued at \$14,000 be assessed to raise \$56?

8. What is the duty on 1,368 pounds of wool, invoiced \$273.60, when the rate is 6 cents a pound, and 10% ad valorem?

9. How many yards of carpeting 27 inches wide will be required for a rectangular room 30 feet by 24 feet, if the strips run lengthwise and 5 inches a strip be allowed for matching?

10. How many rolls of wall paper will be required to cover the walls of a rectangular room of ordinary height, 24 feet by 18 feet, which has 1 door and 3 windows, the door-frame being 3 feet 9 inches wide and the window frames 4 feet 2 inches wide each?

LIX.

1. An agent charged \$5.00 for collecting \$375. What was his rate of commission?

2. A merchant marked his goods to gain 30%, but concluding to give up business he sold his stock at 20% discount from the marked price. What was his net gain per cent.?

3. A lady spent $\frac{2}{3}$ of her money in buying silk at \$1.40 a yard, and then $\frac{1}{2}$ of the remainder for a hat; she had still left \$4.20. How many yards of silk did she buy?

4. By selling an article for \$5.70 the owner loses 5%. For how much must he sell it to gain 5%?

5. A can do a piece of work in 4 days, B in $5\frac{1}{2}$ days. They work at it together for 2 days when A leaves, how long will it take B to finish it?

6. Divide \$7.14 between two boys so that one may receive 60 cents more than twice what the other receives.

7. Two pounds of tea and 6 pounds of sugar cost \$2.20, three pounds of tea and 7 pounds of sugar cost \$2.90. Find the price per pound of tea and sugar.

8. The interest of a certain sum of money for $2\frac{1}{2}$ years at 7% is \$11.90. Find the sum.

9. A man agreed to work for \$1.00 per day, and to forfeit 25 cents every day he was idle. At the end of 30 days his wages amounted to \$25. How many days was he idle?

10. The premium for insuring a school-house at $1\frac{1}{2}\%$ was \$36. For what sum was it insured?

LX.

1. Find the interest on \$375 from June 5th to August 17th, at 6% per annum.

2. Find the cost of digging a cellar 36 feet long, 22 feet wide and $6\frac{1}{2}$ feet deep, at \$1.50 a cubic yard.

3. A grocer sells 55 pounds of tea and sugar for \$19.10—the tea at 50 cents and the sugar at 8 cents per pound. How many pounds of each did he sell?

4. By selling tea at 72 cents a pound, a merchant gains $\frac{1}{5}$ of the cost; he then raises the price to 85 cents a pound; what does he gain on every \$42 of his outlay by the latter price?

5. At what price must I mark cloth which cost me \$3.00 a yard, so that after throwing off 20% of the marked price I may sell it at a gain of 25%?

6. Four men can do a piece of work in 8 days. After they have worked 2 days three boys join them in the work and the whole is done in 6 days. What part of the whole work is done by the boys?

7. The ice on a pond, whose area is $\frac{3}{4}$ of an acre, is 9 inches thick. How many tons of ice may be taken from the pond, if a cubic foot of ice weighs 56 pounds?

8. A grocer mixed 25 pounds of tea worth 30 cents a pound, with 35 pounds of another kind, and then had a mixture worth 37 cents a pound. Find the price of the second tea per pound.

9. If a boy buys oranges at 6 for 4 cents and sells them at 3 for 5 cents, how many must he buy and sell to gain \$5.25?

10. A bought $\frac{5}{23}$ of a certain property for \$1,700. B bought $\frac{3}{17}$ of the same property at a rate 10% higher. What does B's part cost him?

ONTARIO EDUCATION DEPARTMENT EXAMINATION PAPERS.

ADMISSION TO HIGH SCHOOLS.

July, 1880.

1. Multiply one hundred and seventy-four million five hundred and fifty thousand six hundred and thirteen by six hundred thousand and four hundred and seventeen. Explain why each partial product is removed one place to the left.

2. Define *measure*, *common measure*, and *greatest common measure*.

Find the G. C. M. of 153,517, and 7,389,501,522. ✓

3. Show that $\frac{2}{3} = \frac{8}{12}$.

Simplify :

$$\frac{4\frac{11}{13} \text{ of } \frac{8}{15} \text{ of } 7\frac{3}{4}}{12\frac{1}{35} - 2\frac{3}{7}} + \frac{2\frac{1}{3} + 1\frac{35}{48}}{9\frac{2}{7} - 3\frac{39}{112}} - \frac{12354}{12355}.$$

4. A brick wall is to be built 90 feet long, 17 feet high and 4 feet thick ; each brick is 9 inches long, $4\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches thick. How many bricks will be required ?

5. A merchant received a case of goods invoiced as follows :—

12	pieces of silk,	each 48 yards,	at 5s. 3d. a yard.	
15	“ cotton,	“ 60 “	at 6 $\frac{1}{4}$ d.	“
20	“ “	“ 56 “	at 4 $\frac{3}{4}$ d.	“
14	“ linen,	“ 40 “	at 1s. 3 $\frac{1}{2}$ d.	“

Supposing the shilling to be worth 24 $\frac{1}{3}$ cents, find the amount of the above bill of goods.

6. Divide 76·391,955 by nine hundred and twenty thousand three hundred and eighty-five ten-billionths. ✓

7. D. D. Wilson, of Seaforth, exported last year 8,360 barrels of eggs, each containing the same number. He received an average price of 14·85 cents per dozen. Allowing the cost to have been 13·5 cents per dozen, and the entire profit to have been \$7,900.20, find the number of eggs packed in each barrel.

8. The dimensions of the Globe newspaper are 50 inches by 32 inches, and the daily issue is about 24,000 copies ; how many miles of Yonge Street, which is about 70 feet wide, might be covered with ten weeks' issue ?

9. A flag-staff 120 feet high was broken off by the wind and it was found that $\cdot 76$ of the longer part was $\frac{2}{5}$ of $9\frac{1}{2}$ times the shorter part. Find the length of each part.

10. A and B together can do a piece of work in $\frac{3}{4}$ of a day, B and C in $\frac{9}{10}$ of a day, and A and C in $\frac{13}{5}$ of a day. In what time could all working together do the work?

December, 1880.

1. Define—*Number, Numeration, Notation, Addend, Minuend.*

2. Find the G. C. M. of sixty-eight million five hundred and ninety thousand one hundred and forty-two, and eighty-five million forty-four thousand and fifty-nine.

3. For a voyage of 17 weeks a ship takes provisions to the amount of 48 tons 4 hundredweight 2 quarters 20 pounds 9 ounces. Supposing that there are 73 men aboard, how much may be allowed each man per day?

4. Find the amount of the following bill : $14\frac{3}{4}$ pounds beef at 10 cents ; $12\frac{1}{2}$ pounds pork at $9\frac{1}{2}$ cents ; 3 turkeys, weighing in all $35\frac{1}{2}$ pounds, at $12\frac{1}{2}$ cents per pound ; 12 pounds 10 ounces lard at 15 cents a pound ; 5 geese, weighing in all 45 pounds 12 ounces, at 10 cents per pound.

5. Simplify :

$$\frac{5\frac{5}{9} \text{ of } \frac{2}{5} \text{ of } \cdot 3 \cdot \dot{3} \text{ of } 2 - 1\frac{1}{2}}{\frac{1}{17} \text{ of } (2 \cdot 04\dot{5} - \cdot 5)} \text{ of } \frac{\text{£}19 \text{ 16s. } 7\frac{3}{4}\text{d.}}{\text{£}20 \text{ 16s. } 8\frac{3}{4}\text{d.}}$$

6. What is the weight of a block of stone 12 feet 6 inches long, 6 feet 6 inches broad, and 4 feet $1\frac{1}{2}$ inches thick, when a block of the same kind of stone 2 feet 6 inches long, 3 feet 9 inches broad, and 1 foot 3 inches thick, weighs 1,875 pounds?

7. A man, after paying an income tax of $15\frac{1}{2}$ mills on the dollar, and spending $\$3.37\frac{1}{2}$ a day, is able to save $\$1,230.87\frac{1}{2}$ a year. Find his gross income.

July, 1881.

1. Define Subtrahend, Multiplicand, Quotient. Explain the statement—"The multiplier must always be regarded as an abstract number."

Divide 2,000,000,018,760,681 by sixty-three million two hundred and forty-five thousand five hundred and fifty-three.

2. Define Prime Number, Prime Factors. How do you resolve a number into its prime factors? Resolve 132,288, and 107,328 into their prime factors, and find the least common multiple of these numbers.

3. How many minutes are there in $\frac{1}{10}$ of a year (365 days) + $\frac{3}{50}$ of a week + $\frac{5}{24}$ of $3\frac{1}{2}$ days?

4. Simplify :

$$\frac{\frac{17}{10} + \frac{7}{11}}{\frac{17}{10} - \frac{7}{11}} - \frac{9 + \frac{1}{2}}{2 + 2\frac{1}{3}} + 1,761\frac{1}{2} - 1,650\frac{1}{2}$$

5. A grain dealer buys 5,225 bushels of wheat at \$1.05 per bushel, and paid \$125 for insurance, storage, etc.; he sold $\frac{1}{4}$ of the quantity at 97 cents per bushel. At what price per bushel must he sell the remainder in order to gain \$522.50 on the whole?

6. Find the quotient of $.9840018 \div .00159982$ to seven decimal places; and reduce $.7002457$ to a vulgar fraction.

7. Water, in freezing, expands about *one-ninth* in volume. How many cubic feet of water are there in an iceberg 445 feet long, 100 feet broad and 175 feet high?

December, 1881.

1. Divide three hundred and fourteen and *one hundred and fifty-nine thousandths* by eight thousand nine hundred and thirty-seven *ten-billionths*.

2. Divide the difference of $13\frac{1}{3} \div [(2\frac{6}{7} - 2\frac{8}{11}) \times 1\frac{1}{2}]$ and $[13\frac{1}{3} \div (2\frac{6}{7} - 2\frac{8}{11})] \times 1\frac{1}{2}$ by $13\frac{1}{3} \div 2\frac{6}{7} - 2\frac{8}{11} \times 1\frac{1}{2}$.

3. Find the amount of the following bill in dollars and cents, the shilling being worth $24\frac{3}{4}$ cents: 115 yards of carpet at 5s. 10d.; 95 yards at 2s. 7d.; 84 yards at 3s. 7d.; 72 yards at 2s. 8d.; 10 dozen stair rods at 5s. 6d.

4. Lead weighs 11.4 times as much as water, and platinum weighs 21 times as much as water. What weight of platinum will be equal in bulk to 56 pounds of lead?

5. Find the difference in cost between 200 feet of chain cable, 76 pounds to the foot, and 600 feet of wire rope, 18 pounds to the foot, the chain costing 15s. 6d., and the rope costing 23s. 6d. per hundred-weight.

6. By selling tweed at \$2.60 a yard, it was found that $\frac{5}{8}$ of the cost was gained; what selling price would have gained $\frac{7}{8}$ of the cost?

7. A plate of copper 5 feet 6 inches long, 3 feet wide, and $\frac{3}{4}$ of an inch thick, is rolled into a sheet 4 feet 6 inches wide, and 6 feet long. Find its thickness.

8. How many bricks 9 inches long, $4\frac{1}{2}$ inches wide and 4 inches thick, will be required for a wall 60 feet long, 17 feet high and 4 feet thick, allowing that the mortar increases the bulk of each brick $\frac{1}{16}$?

9. A grocer gained 20% by selling 10 pounds of sugar for \$1. Afterwards he increased his price, giving only 9 pounds for \$1. How much per cent. did he make at the increased price?

June, 1882.

1. Define Greatest Common Measure. State the principle on which the rule for finding the G.C.M. of two numbers depends.

Find the G.C.M. of 68,590,142, and 85,054,059.

2. A dealer bought 8 carloads of lumber, each containing 9,870 feet, at \$13.50 per M. He retailed it at \$1.43 per 100 feet. Find his gain on the whole lot.

3. Show that $\frac{3}{4} = \frac{6}{8}$, and that $\frac{2}{3} \div \frac{4}{5} = \frac{10}{12}$.

Simplify :

$$\frac{26\frac{3}{4} - 11\frac{1}{2}}{\frac{4}{9} + 1\frac{1}{3} - \frac{3}{5} \text{ of } \frac{17\frac{1}{2}}{12} \text{ of } \frac{5}{9} \div \frac{35}{24}} \text{ of } \frac{5\frac{1}{2}}{521}$$

4. Prove that $2.3 \times .04 = .092$.

Add together 154.2125, .5421, .0001235, 741.206, .03, and 4567.0004.

Reduce 75.0125 cwt. to ounces.

5. A steamer makes a nautical mile (6,072 feet) in 3 minutes 50 seconds. Find her rate per hour in statute (common) miles.

6. There is a solid pile of bricks which is 36 feet long, 16 feet 6 inches wide and 14 feet 6 inches high, and contains 122,496 bricks of uniform size; each brick is 9 inches long and $4\frac{1}{2}$ wide. Find its thickness.

7. A London merchant transmits £250 10s. through Paris to New York; if £1 = 24 francs, and 6 francs = \$1.14 American currency, what sum in American currency will the merchant realize?

8. In a map of a country the scale is $\frac{1}{10}$ of an inch to a mile (*i.e.*, $\frac{1}{10}$ of an inch represents a mile), and a township is represented on this map by a square whose side is half an inch. How many acres in a township?

9. If 4 men or 6 boys can do a work in 8 days, how long will it take 8 men and 4 boys to do such a piece of work?

19. A and B were candidates for election in a constituency of 2,700 voters. The votes polled by A were, to those polled by B, as 23 to 25, and B was elected by a majority of 100. How many persons did not vote ?

December, 1882.

1. From 935 take 846, explaining clearly the reason for each step.

The difference between 82,610 and the product of two numbers is 70,300.000. One of the numbers is 9,402 ; find the other.

2. Find the amount of the following bill : 36 pounds 8 ounces beef at 16 cents ; 16 pounds 10 ounces mutton at 14 cents , 7 pounds 12 ounces pork chops at 12 cents ; 15 pounds 6 ounces turkey at 18 cents ; 4 pounds 10 ounces suet at 16 cents.

3. Find the L.C.M. of 11, 14, 28, 7, 56, 42, 81 ; and the G.C.M. of 40,505, and 124,083.

4. Prove that $\frac{3}{4}$ of 1 = $\frac{1}{4}$ of 3.

Simplify :

$$\frac{\frac{5}{16} - \frac{3}{12} \text{ of } \frac{1}{2}}{\frac{5}{16} + \frac{7}{12} \text{ of } 3\frac{1}{4} - (\frac{7}{8} \text{ of } \frac{3}{2} - \frac{1}{3})} \div \frac{\frac{1}{3} \text{ of } \frac{1}{2} + \frac{3}{2} \text{ of } 5}{9\frac{1}{3} - 1\frac{2}{3}}$$

5. Prove that $1.025 - .05 = 20.5$.

Find the cost of .0625 of 112 pounds sugar, when 1 pound cost .0703125 of 16s.

6. Reduce 45,740,108 square inches to acres.

7. The bottom of a cistern is 7 feet 6 inches by 3 feet 2 inches. How deep must it be to contain 3,750 pounds of water, a cubic foot of water weighing 1,000 ounces ?

8. A runs a mile race with B and loses ; had his speed been a third greater he would have won by 22 yards. Find the ratio of A's speed to B's.

9. A does $\frac{2}{3}$ of a piece of work in 6 hours ; B does $\frac{3}{4}$ of what remains in 2 hours, and C finishes the remainder of the work in 30 minutes. In what time would all working together do the work?

10. By selling tea at 60 cents a pound a grocer loses 20%. What should he sell it at to gain 20% ?

June, 1883.

1. What is the object of Division ? Write down the relation connecting the Divisor, Dividend, Quotient and Remainder.

Divide 108,419,716,001 by 18,748,005.

2. Find, by casting out the nines, whether the following is correct:— $349,751 \times 28, 637 = 10, 015, 819, 397$.

Find the weight of 500,000 bricks at 4 pounds 2 ounces each, and the cost in dollars and cents, at 27s. 6d. each, allowing 4s. 2d. to make a dollar.

3. A merchant received from England the following invoice in sterling :—

375 tons iron plates, at £8 15s. 6d.
 $107\frac{1}{2}$ tons bar iron, at £11 14s.
 10 tons bulb iron, at £10 10s.
 48 tons steel, at £18 7s. 6d.
 15 tons rivets, at £11 1s.
 17 tons T iron, at £15 10s.

Find the amount of this invoice in Canadian currency, allowing the shilling sterling to be equal to $24\frac{1}{3}$ cents.

4. At \$1.75 a rod, what will it cost to fence a piece of land 63.5 rods long and 27.75 rods wide?

5. Simplify :

$$1 - \frac{1}{6} + \frac{1}{24} - \frac{161}{5040} + \frac{277}{720} ; \text{ and } \frac{4\frac{7}{10} + 5.\dot{8}1 - 2.5}{4\frac{7}{10} \text{ of } 32 \text{ of } 45.}$$

6. Gunpowder is composed of nitre, charcoal and sulphur, in the proportion of 15, 3 and 2. A certain quantity of gunpowder is known to contain 20 hundredweight of charcoal; find its weight, and also the weight of nitre and of sulphur it contains.

7. Bought 360 gallons of wine at \$2.60 a gallon; paid for carriage, \$17 20, and for duties \$86.50. If $\frac{3}{10}$ of it be lost by leakage, at what price must the remainder be sold to gain \$50 on the whole transaction?

8. Find the interest on a note for \$257.81, dated January 3, 1883, and paid April 6, 1883, at 8% per annum.

9. The length of a second's pendulum is 39.37079 inches; if 64 French metres are equal to 70 yards, by what decimal of an inch will the length of a second's pendulum differ from one metre?

10. At what time between 4 and 5 o'clock are the hands of a clock (1) coincident, (2) at right angles?

December, 1883.

1. Multiply the sum of 59,404 and 47,675 by their difference, and divide the product by $7 \times 13 \times 19$.

2. Bought oranges at the rate of 10 cents a dozen, and sold them at the rate of 5 oranges for 11 cents. How much did I gain on 11 boxes, each containing 20 dozen?

3. A man bought a rectangular field, 40 rods long by 25 rods wide, paying therefor at the rate of \$300 per acre, and then had it fenced at the rate of \$1.50 per rod. Prove that the land cost him exactly ten times as much as the fence.

4. Divide \$1,200 among A, B and C, so that A may have \$70 more than B and twice as much as C.

5. Divide the sum of $\frac{2}{5}$ of $8\frac{1}{3}$ and $2\frac{1}{7}$ of $5\frac{5}{6}$ by the difference between $\frac{3}{7}$ of $3\frac{1}{2}$ and $\frac{1}{2}$ of $\frac{1}{3}$ of $2\frac{2}{3}$.

6. Add together 1.302, 3.2589 and 40.93. Multiply the sum by .00297 and divide the product by 90.09. (Decimals, not vulgar fractions, to be used in doing the work, otherwise no marks to be allowed.)

7. A farmer sold a load of hay at \$16.25 per ton; the whole weight of the wagon and hay was 2,875 pounds; the wagon alone was found to weigh 1,083 pounds. How much did the farmer receive for his hay?

8. A can run a mile race in 5 minutes, B in 6 minutes. How many yards start should A allow B in order to make their chances equal?

9. Three men can dig a certain drain in 8 days. They work at it for 5 days, when one of them falls ill, and the other two finish the work in 5 days more. How much of the work did the first man do before he fell ill?

10. Find the interest on \$275.80 for 91 days at 7% per annum.

June, 1884.

1. The quotient is 12,434, the remainder 2743, and the dividend eighty-seven millions nine hundred and eleven thousand one hundred and twenty-three. Find the divisor.

2. Find the L. C. M. of 11, 7, 21, 28, 22, 27, 81, 243, 216, and the G. C. M. of 94,605 and 96,509.

3. A sidereal day is 23 hours 56 minutes, and the mean solar day is 24 hours. Reduce the difference between the two to the decimal of a sidereal day.

4. Simplify :

$$(1). \frac{(3\frac{2}{5} - \frac{2}{11}) \text{ of } 6\frac{5}{12}}{1\frac{7}{10} - \frac{1}{11} \text{ of } 12\frac{5}{6}} \div (6\frac{1}{5} - 1\frac{1}{7}).$$

$$(2). \frac{\frac{3}{16} \text{ of a guinea} - \frac{2}{15} \text{ of a } \pounds.}{8s. 10\frac{3}{4}d.}$$

5. A grain dealer bought 64 bags of oats, weighing (including bags) 3,616 pounds. The bags averaged 1 pound 12 ounces each. The dealer paid 34 cents a bushel for the oats and sold them at 42½ cents a bushel. How much was his gain?

6. A plate of metal ½ inch thick was burnished on one side for 11s. 6½d, at 2¼d per square inch. Find the weight of the plate, supposing a cubic foot of the metal to weigh 62½ pounds.

7. A, B and C do a work in 12 hours; A and B can do it in 16 hours, and A and C in 18 hours. In what time can each do it separately?

8. An army, in its first engagement, lost 1 in 10 in killed and wounded, and in its second engagement 3 in 25 of the remainder; there were then 3,960 men left. How many men went into the first engagement?

9. Find the duty on 8 hogsheads of sugar, each weighing 1,200 pounds gross, at 1⅓ cents per pound, 16% being allowed for tare.

10. (1) Find the interest on \$225.40 for 16 months at 8% per annum.

(2) The amount of a certain principal was \$307.20 for 3½ years, and \$312 for 3¾ years. Find the principal and the rate.

December, 1884.

1 Of what number is 8,967 both divisor and dividend?

2. Find the greatest number that will divide 11,067 and 35,602; leaving as remainders respectively 17 and 21.

3. Find the amount of the following bill:—12½ yards cassimere at \$2.75 per yard; 18⅓ yards silk at \$1.17; 23¾ yards flannel at 37½ cents; 112 yards print at 9⅓ cents; 55 yards shirting at 17½ cents; 37½ yards tweed at \$1.12.

4. Simplify :

$$(a) 5\frac{1}{2} + 2\frac{1}{3} \div 11\frac{3}{4} \times 7\frac{1}{2} + \frac{\$18.64}{\$1.16\frac{1}{2}}$$

$$(b) \{ \frac{4}{5} \times \frac{9}{11} \times 0.02 \times 0.456 \} \div \frac{1}{17} \text{ of } \frac{2}{3}.$$

5. The cost of carpeting a room 15 feet long, with carpet 27 inches wide, costing 90 cents a yard, is \$22.50. What is the width of the room?

6. A boy can do a piece of work in $4\frac{2}{3}$ days, and a man can do the same in $\frac{2}{3}$ of the time. How many days will both working together require to do five times the amount of work?

7. How much water must be added to 92 gallons of brandy worth \$4.60 a gallon, in order that the mixture may be worth only \$3.60 a gallon?

8. Find the simple interest on \$275.60 from 18th July, 1883, till 13th September, 1884, at 6% per annum.

9. At what time are the hands of a clock exactly 2 minute spaces apart between 4 and 5 o'clock?

June, 1885.

1. Express in words :—17089653·005904, \$705·637 and MDCC-CLXXXV.

2. Simplify :— $\frac{7}{4}(3\frac{1}{2} + 9\frac{1}{4}) \div \frac{4}{1\frac{2}{3}}$ of $\frac{\text{£}15. 10\text{s. } 2\text{d.}}{16\text{s. } 2\text{d.}}$

3. Find the value of $17\cdot65\dot{4} + 4\cdot83\dot{5} + 6\cdot40\dot{8}$.

4. Make out a bill of the following goods :—23 yards cotton at 11 cents ; 13 yards gingham at 23 cents ; 25 yards flannel at 37 cents ; $18\frac{1}{3}$ yards tweed at \$1.50 ; $12\frac{1}{2}$ yards serge at \$1.75 ; $6\frac{1}{2}$ yards broad-cloth at \$4.50.

5. A merchant purchases sugar at \$7.50 per hundredweight ; at what price per pound must he sell it in order to gain 10 %?

6. Find the simple interest on \$167 for 3 years, 9 months, at 7% per annum.

7. In what time will any sum of money double itself, at 6% simple interest?

8. \$1,200 is to be divided between two persons A and B, so that A's share is to B's share, as 2 to 7. Find the share of each.

9. At what two times between 3 and 4 o'clock are the hands of a watch equally distant from the figure III.

10. A man having \$720 spends a part of it, and afterwards received $7\frac{1}{2}$ times as much as he spent ; he then had \$1,305. How much did he spend?

December, 1885.

1. Define the following terms :—Factor, Prime number, Multiplication. Write down all the prime factors of 2,310.

2. (a) Reduce to simplest form :— $\frac{9534}{15663}$.

(b) What is the least number from which 1,224 and 1,656 may each be taken an exact number of times ?

3. A man who lost $\frac{1}{3}$ of his fortune in one year, and $\frac{2}{7}$ of the remainder the next year, had \$900 left. Find the amount of his fortune at first.

4. What quantity taken from $159\frac{1}{7}$ will make it exactly divisible by $12\frac{5}{8}$?

5. Express 3·74976 minutes as the decimal of a week.

6. What will 11,750 feet of lumber cost at \$27.50 per thousand ?

7. Name the units of length, time, and sterling money.

8. Find the simple interest on \$800 for 3 years at $5\frac{1}{2}\%$.

9. A cistern has three pipes ; the first will fill it in 10 hours, the second in 12 hours, and the third in 15 hours. In what time will they together fill the cistern ?

July, 1886.

1. (a) Multiply the sum of forty-eight thousand six hundred and thirty-nine, and thirty-nine thousand five hundred and thirty-seven by their *difference* and divide the *product* by sixty-four.

(b) The product of four numbers is 827,658,432 ; the first number is 12, the product of the second and third is 144. Find the fourth

2. Make out a bill of the following articles :—

28 $\frac{1}{2}$ yards flannel, at 68 cents ;

35 yards calico, at 15 cents ;

3 $\frac{1}{2}$ dozen pairs of stockings, at \$2.10 ;

7 pairs of gloves, at 90 cents ;

12 $\frac{1}{2}$ yards linen, at \$1.12 ;

4 pairs of muslin curtains, at \$4.20.

3. What will it cost to fence a lot 49 feet front and 180 feet depth at \$1.15 a foot ?

4. (a) A horse worth \$170 and 3 cows worth \$36 each were exchanged for 14 calves and \$82. Find the value of a calf.

(b) A farmer sold an equal number of horses, cows and calves, receiving \$3,540 for the whole. Valuing a horse at \$69, a cow at \$37 and a calf at \$12, find the number of each.

5. (a) What sum of money will produce \$300 interest in $2\frac{1}{2}$ years, at 6% simple interest.

(b) At what rate per cent., simple interest, will a sum of money amount to 3 times itself in 25 years?

6. Divide \$1,000 among A, B and C, so that A may have \$60 more than B, and twice as much as C.

7. Five men can do a certain piece of work in 20 days; after working 15 days they are joined by another man, and the whole work is completed in 19 days. What fraction of the work is done by the sixth man?

8. In a 440-yards bicycle race A can give to B 20 yards start, and to C 30 yards. B and C ride a 440-yards race, starting even. By how much does B win?

December, 1886.

1. Simplify $\frac{1}{2} - \frac{2}{3}$ of $\frac{5}{8} + \frac{7}{8}$ and find how many times the result is contained in $\frac{3}{8} \div (\frac{7}{9} \text{ of } \frac{3}{4} - \frac{1}{8})$.

2. Divide the product of .037 and .0025 by the sum of .9, .02 and .005.

3. If a road is 4 rods wide, how many miles of it will make 10 acres?

4. A lot 150 feet long and 100 feet wide to be surrounded by a close board fence 6 feet high. What will the boards cost at \$12.50 per thousand feet?

5. A farmer bought a number of horses and cows for \$2,000. There were three times as many cows as horses, and a horse cost twice as much as a cow. If each horse cost \$80 how many cows did he buy?

6. A man has a salary of \$400 a year and has \$500 in the bank. If he spends \$500 a year, in what time will his money be all gone?

7. What will a dollar amount to in 3 years 219 days at $7\frac{1}{2}\%$ per annum?

8. A man borrows \$900, for the use of which he has to pay \$3 a month. How long will he have had it, when the interest is 50 cents on every dollar borrowed?

9. A dealer sold an article for \$8.10 and lost 10%; at what selling price would he have gained 10%?

10. How can you tell, without actual division, whether a number can be divided by 9 without leaving a remainder?

11. If a cow gives 12 quarts 1 pint of milk every day, and 1 pound 8 ounces of butter can be made from 25 quarts of milk, how many pounds of butter can be made in one week from the milk of 16 cows?

12. A man bought a quantity of tea supposed to be done up in packages of 1 pound each, for which he was to pay \$64; on weighing them, however, it was found that each package was 1 ounce too light. How much should he pay for the tea?

July, 1887.

1. What multiple of 595 divided by 595 gives as quotient 595?

2. Find the least common multiple of \$2, \$3, \$4, \$5, \$10, \$20, \$50 and \$100.

3. A man owns $\frac{3}{5}$ of $\frac{5}{6}$ of $\frac{7}{10}$ of an investment; on selling $\frac{2}{7}$ of his share he finds himself worth \$100 less than before. What is the value of the whole investment?

4. Change $\frac{1}{3}$ of $\frac{1}{3} + \frac{\frac{1}{3}}{3 + \frac{1}{4}}$ to a simple fraction.

5. What principal will amount to \$840 in 5 years at $4\frac{1}{2}\%$?

6. If 1 pound of thread makes 3 yards of linen $1\frac{1}{4}$ yards wide, how many pounds would make 45 yards of linen 1 yard wide?

7. A man sold two farms for \$3,000 each; on one he gained 20% and on the other he lost 20%. Did he gain or lose on the whole, and how much?

8. If a garrison of 1,000 men have provisions for 12 months, how long will the provisions last if at the end of 2 months they be reinforced by 500 men?

9. A merchant sold a piece of cloth for \$24 and thereby lost 25%. What per cent. would have been the gain had he sold it for \$34?

December, 1887.

1. Ten cents will buy 3 oranges, 4 lemons or 5 apples. How many apples are worth as much as 5 dozen oranges and 7 dozen lemons?

2. A man can run 100 yards in 10 seconds. How many miles will a steamboat go in $5\frac{1}{2}$ days at the same rate?

3. Find the interest on \$150 from the 16th of July to the 9th of December, at 5% per annum.

4. A person borrows money for 6 years at $3\frac{1}{2}\%$, and repays at the end of the time as principal and interest, \$847. How much did he borrow?

5. A map is drawn to the scale of $\frac{1}{2}$ an inch to a mile. How many acres are represented by a square inch on the map?

6. One workman charges \$3.00 for a days work of 8 hours, and another \$3.50 for a days work of 9 hours. Which had I better employ, and how much shall I have to pay him for work that he can do in a fortnight, working 6 hours a day?

7. Water in freezing expands 10%. If a cubic foot of water weighs 1,000 ounces, find the weight of a cubic foot of ice.

8. A merchant bought 1,000 yards of carpet at 60 cents a yard, and sold $\frac{2}{5}$ of it at a profit of 30%, one half at a profit of 20% and the rest at a loss of 20%. How much did he receive for the carpet?

9. A piece of land is surrounded by a stone wall 8 feet high and 2 feet thick : the land inside the wall is 100 feet long and 50 feet wide ; how many cubid feet of stone does the wall contain?

10. A house and lot are together worth \$2,100; $\frac{1}{4}$ of the value of the house is equal to $\frac{1}{3}$ of the value of the lot ;find the value of each.

11. A cubical cistern is 5 feet deep, how many gallons of water will it hold if 277·274 cubic inches make a gallon?

July, 1888.

1. Prove the rules for division (1) of vulgar fractions, (2) of decimals, using as examples $\frac{3}{4} \div \frac{5}{7}$ and $\cdot 012 \div \cdot 6$.

2. A produce merchant exchanged $48\frac{3}{4}$ bushels of oats at $39\frac{3}{4}$ cents per bushel, and $13\frac{1}{2}$ barrels of apples at \$3.85 a barrel for butter at $37\frac{1}{2}$ cents a pound. How many pounds of butter did he receive?

3. A train going 25 miles an hour starts at 1 o'clock p.m. on a trip of 280 miles ; another going 37 miles an hour starts for the same place at 12 minutes past four o'clock p.m.; when and where will the former be overtaken?

4. If in a certain town \$3,093.75 was raised from a $\frac{3}{4}\%$ tax, what was the value of the property in the town?

X 5. By selling my cloth at \$1.26 a yard I gain 11 cents more than I lose by selling it at \$1.05 a yard. What would I gain by selling 800 yards at \$1.40 a yard?

6. How many thousand shingles 18 inches long and 4 inches wide, lying $\frac{1}{2}$ to the weather, are required to shingle the roof of a building 54 feet long, with rafters 22 feet long, the first row of shingles being double?

7. A farmer employs a number of men and 8 boys; he pays the boys \$.65 and the men \$1.10 per day. The amount that he paid to all was as much as if each had received \$.92 per day; how many men were employed?

8. A field whose length is to its width as 4 to 3, contains 2 acres, 2 roods, 32 rods; what are its dimensions?

9. A man having lost 20% of his capital is worth exactly as much as another who has just gained 15% on his capital; the second man's capital was originally \$9,000. What was the first man's capital?

December, 1888.

1. Write down neatly the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	\$29.87	\$31.47	\$33.35	\$35.00	\$26.16	\$48.17	.....
2nd	27.38	30.05	28 39	34.83	27.67	49.99	.....
3rd	19.96	29.70	29.98	36 10	25.49	47.30	.....
4th	23.19	32.73	31.80	37.91	27.84	50.00	.....
5th	17.84	31.19	27.36	35.55	28.10	53.94	.....
6th	12.09	26.07	24.09	31.87	29.15	57.77	.....
Totals.	.....	.....	.....	.....	.....	201.17	.....

2. If you buy 3 pounds of butter at 28 cents a pound, 5 pounds of tea at 56 cents a pound, 6 bars of soap at 17 cents a bar, 12 gallons of oil at 27 cents a gallon, and 3 oranges at 40 cents a dozen, and the merchant throws off 10 cents for each dollar's worth purchased; how much change would you get out of a \$10 bill?

3. Divide \$82.60 among 27 men and 37 boys, so that each man may have three times as much as each boy.

4. Find the interest on \$387.56 from March 18th to November 19th at 6% per annum.

5. A bushel of potatoes weighs 60 pounds. If a grocer buys a ton of potatoes for \$15 and sells them for 15 cents a peck, how much per cent. will he gain?

6. A barn 80 feet long and 60 feet wide is built on a plot of ground 308 feet long and 204 feet wide. The rest of the plot is covered with cordwood to a depth of 8 feet. How many cords of wood are there?

7. The interest on \$870 for 4 years, 6 months is \$274.05. How much will \$1,000 amount to in three months at the same rate?

8. A lot 11 rods long and 9 rods wide has a fence built round it. Outside the lot, at a distance of 2 feet from the fence, a sidewalk 4 feet wide is built; how many square yards of ground does the sidewalk cover?

July, 1889.

1. A bushel of wheat weighs 60 pounds and a barrel of flour weighs 196 pounds. If 3 pounds of wheat makes 2 pounds of flour, how many barrels of flour can be made from 343 bushels of wheat?

2. Find the interest on \$597.50 for 2 years, 5 months, 12 days at 8% per annum.

3. A and B start together and walk in the same direction, A at the rate of 4 miles an hour, and B at the rate of 3 miles an hour. At the end of 7 hours A turns and goes back. How many miles will B have gone when he meets A?

4. The circumference of a wheel is $\frac{2}{7}$ of its diameter; find the diameter of a wagon wheel which makes 360 revolutions in going a mile

5. A town, whose population was 10,000, increased 10% every year for 3 years; what was its population at the end of that period?

6. The map of Ontario recently issued by the Crown Lands Department is drawn on a scale of 8 miles to an inch. On this map the township of Scott measures $1\frac{5}{16}$ inches in length and $1\frac{1}{2}$ in width; how many acres does it contain?

7. If for \$7 I can have the use of \$35 for 3 years, 4 months, how much a month shall I have to pay for the use of \$8,750?

8. It is required to build a sidewalk a quarter of a mile in length, 8 feet wide and 2 inches thick, supported by 3 continuous lines of scantling 4 inches square; what will the lumber cost at \$17 per thousand feet?

9. Write down neatly the following statement of six weeks' cash receipts ; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results :—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	\$28.79	\$34.71	\$35.33	\$30.10	\$27.97	\$47.81	.....
2nd	23.87	30.03	29.38	33.84	26.77	48.77	.....
3rd	16.99	27.09	28.77	30.16	24.95	43.07	.....
4th	29.13	33.72	30.81	39.17	28.47	50 05	.....
5th	18.47	32.29	26.73	34.45	28.88	54.39	.....
6th	19.02	27.06	29.04	29.89	29.51	61.93	.....
Totals.	.....	.....	.....	.....	.....	.....	.....

December, 1889.

1. A fruit merchant bought a quantity of apples for \$144 ; he sold half of them for \$82.80, thereby gaining 12 cents a bushel on what he sold. What did the apples cost him per bushel ?

2. Find the interest on \$84.25 from April 16, 1888, to November 4, 1889 at 7% per annum, (year=365 days).

3. A pint contains 9,000 grains of barley and each grain is $\frac{1}{8}$ of an inch long. How far would the grains in 17 bushels, 3 pecks, 1 gallon, 1 quart, 1 pint, reach if placed one after another ?

4. An orchard is $24\frac{2}{3}$ rods long, and $15\frac{1}{4}$ rods wide. At $1\frac{3}{4}$ cents per cubic foot what will it cost to dig a ditch around it 3 feet 9 inches wide and 4 feet deep ?

5. A sold a town lot to B and gained $12\frac{1}{2}\%$. B sold it to C for \$306 and lost 15%. How much did the lot cost A ?

6. In a room 26 feet, 6 inches long, 16 feet, 8 inches wide, and 12 feet, 3 inches high, there are 3 windows each $5\frac{1}{2}$ feet high and 3 feet wide, and two doors each 7 feet high and $3\frac{1}{2}$ feet wide. The baseboard is 9 inches wide. How much paper, $\frac{7}{8}$ of a yard wide, will be required to cover the walls and ceiling ?

7. A farmer sells to a merchant 3,015 pounds of hay at \$16 a ton, and takes in payment 6 pounds of tea at 80 cents a pound ; $22\frac{1}{2}$ pounds of coffee at 26 cents a pound ; 33 pounds of sugar at 12 pounds for a dollar ; $32\frac{4}{5}$ pounds of raisins at $18\frac{3}{4}$ cents a pound ; 14 pounds, 13 ounces of bacon at 16 cents a pound ; and the balance in cash. How much cash does the farmer receive ?

8. Brown purchased $\frac{7}{25}$ of a mill property for \$4,064.55, and Smith purchased $\frac{9}{35}$ of the same property at a rate 5% higher. What did Smith's part cost him, and what fraction of the property remains unsold?

9. My farm contains exactly 184 acres, 76 square rods, $24\frac{1}{2}$ square yards. There are 3.85 acres in garden and orchard; 9.147 acres of green crop; 76.9 acres of grain; 23.608 acres of meadow; 34 acres of pasture; and the remainder is uncleared bush. What per cent. of my farm is uncleared?

10. Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	\$95.65	\$89.24	\$59.79	\$78.04	\$59.37	\$98.16	.....
2nd	71.58	65.41	67.24	62.49	67.02	51.42	.....
3rd	58.47	57.99	50.60	71.08	82.91	76.89	.....
4th	69.29	80.07	91.87	93.74	63.36	90.21	.....
5th	45.81	93.56	82.54	57.96	72.12	67.96	.....
6th	63.42	77.68	79.18	86.60	87.31	82.75	.....
Totals.	.....	.....	.....	.....	.....	.....	.....

July, 1890.

1. Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally and prove the correctness of the work by adding your results:—

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL.
1st	\$65.95	\$24.89	\$79.79	\$40.78	\$37.59	\$89.61	.....
2nd	58.71	41.65	24.67	94.26	70.26	42.51	.....
3rd	47.58	99.57	50.60	80.71	91.82	89.76	.....
4th	29.69	70.80	87.91	74.93	36.63	21.90	.....
5th	81.45	56.93	54.82	96.57	12.72	96.67	.....
6th	42.63	68.77	81.79	60.86	31.87	75.82	.....
Totals.	.....	.....	.....	.....	.....	.....	.....

No marks will be allowed for this question, unless all the work is correctly done.

2. A person sold A $\frac{3}{4}$ of his land, B $\frac{1}{5}$ of the remainder, C $\frac{5}{6}$ of what then remained, and received \$50 for what he had left, at \$60 per acre. Find the number of acres he had at first.

3. A grocer bought 6 cwt. of sugar for \$52.10; he used 65 lbs. himself and sold the rest so as to make $1\frac{1}{2}$ cents per lb. profit on the whole quantity. How much per lb. did he sell it for?

4. A starts from Kingston to walk to Belleville, a distance of 45 miles, at $3\frac{1}{2}$ miles an hour, and B starts from Belleville 3 hours earlier at $2\frac{1}{2}$ miles an hour. Where do they meet, and how far will B be from Kingston when A arrives at Belleville?

5. A note for \$162.50, with interest at $5\frac{1}{2}$ per cent., was given on January 14th, 1889, and paid on November 28th, 1890. What was the amount paid?

6. A certain hall 60 feet long is to be carpeted. It is found that by stretching the carpet lengthwise, any one of four pieces, width respectively $\frac{3}{4}$ yd., 1 yd., $1\frac{1}{4}$ yd., and $1\frac{1}{2}$ yd., will exactly fit the hall without cutting anything from the width of the carpet. If the narrowest piece, worth \$1.10 per yard, be chosen, what will it cost to carpet the hall?

7. I bought a bush farm, 180 rods long by 96 rods wide, at \$12.50 per acre. I paid \$14.75 per acre for clearing and \$1.35 a rod for enclosing the whole farm with wire fencing. Taking into account that I sold the wood for \$1,160 and ashes for \$17.20, how much has the improved farm cost me per acre?

8. A loaned B \$120 for 1 year and eight months and received as payment in full at the end of that time \$130.25. What rate per cent. interest did B pay?

9. A farmer sells a merchant 30 bushels of wheat at 90 cents per bushel and makes a profit of 20 per cent.; the merchant sells the farmer 5 yds. of broadcloth at \$3.60 per yd., 16 yds of calico at 8 cents per yd., and 44 yds. of cotton cloth at 13 cents per yd., and makes a profit of 25 per cent. Which gains the more by the transaction and how much?

June, 1891.

NOTE.—Candidates are to take the first question and any six others. A maximum of five marks may be allowed for neatness.

1. Write down the following statement of six weeks' cash receipts; add the amounts vertically and horizontally, and prove the correctness of your work by adding your results:

	MON.	TUES.	WED.	THUR.	FRI.	SAT.	TOTAL
1st	\$75.59	\$62.68	\$59.63	\$62.78	\$67.36	\$91.34	.....
2nd	82.61	79.81	48.79	92.13	81.78	87.17	.....
3rd	56.95	49.83	89.64	47.85	78.81	79.68	.....
4th	91.04	75.16	46.98	39.67	59.76	95.79	.....
5th	68.17	34.75	77.63	85.94	93.19	86.97	.....
6th	47.80	81.14	67.19	49.85	48.77	98.99	.....
Totals.	.....	.....	.....	.....	.....	.....	.....

(No marks will be allowed for this question unless all the work is correctly done).

2. A note of \$360, drawn April 20th, 1890, is paid July 2nd, 1891, with interest at $7\frac{1}{2}$ per cent. per annum. Find the amount paid.

3. Brooms are bought wholesale at \$20 a gross; what per cent. profit will be made by selling them at 20 cents each?

4. Express, as a fraction of an acre, the sum of the following: $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{1}{16}$ of an acre; $\frac{2}{3}$ of $\frac{1}{21}$ of $\frac{8}{9}$ of 100 sq. rods; $\frac{6}{7}$ of $2\frac{1}{3}$ times 605 sq. yards?

5. A drover lost .065 of his flock by wolves, .105 by disease and .27 by theft. He then sold .75 of what remained, and has 280 sheep left. Find the number in his original flock.

6. A legacy of \$9,500 is to be divided among A, B and C, so that A will get $\frac{5}{9}$ of the whole, and B will get $\frac{3}{4}$ as much as C. Find the shares of each.

7. The difference in weight of two chests of tea is 25 lbs.; the value of both at 65 cents a lb. is \$113.75. How many lbs. of tea are in each chest?

8. Find cost of digging a cellar 48 ft. long, 30 ft. wide and 6 ft. deep, at 20 cents per cubic yard, and flooring it with Portland cement at 10 cents per square yard.

9. Farmer B sold to a merchant the following articles to apply on an overdue account of \$54.45: 1,680 lbs. of hay at \$15 per ton, $3\frac{3}{4}$ cords of wood at \$4.80 per cord, 4 bbls. of apples at \$2.75 per bbl., 350 lbs. of flour at \$2.50 per cwt., 30 lbs. 10 oz. butter at 16c. per lb. Make out the account neatly, showing the balance, and to whom due.

June, 1892.

NOTE.—Candidates are to take the first question and any six others. In the first question four marks are to be allowed for FORM,

and twelve for the calculation ; but no value shall be given for the calculation unless the result is absolutely correct. A maximum of five marks may be added for neatness.

1. Make out the following account, *neatly* and accurately, in *proper form* :

Nicholas Nickleby bought the goods from you on March 3rd, and paid you \$10 on account April 8th.

3 $\frac{3}{4}$ lbs. Tea, at 80c.
 300 lbs. Sugar, at 4 $\frac{3}{4}$ c.
 45 yds. Print, at 11 $\frac{1}{2}$ c.
 2 $\frac{1}{4}$ galls. Syrup, at 65c.
 12 $\frac{1}{2}$ yds. Towelling, at 12 $\frac{1}{2}$ c.
 $\frac{3}{4}$ doz. Knives and Forks, at \$2.50.
 27 lbs. Cheese, at 15c.
 1 lb. 10 oz. Lemon Peel, at 32c. per lb.

2. A load of wood, 10 ft. long, 3 ft. 8 inches wide and 3 ft. high, was sold for \$3.

(a) What was the price per cord ?

(b) At \$4 per cord what would the load be worth ?

3. How much will it cost to paint the outside and both floors of a two-storey cottage, 36 feet long, 33 feet wide and 18 feet high, at 10c. per sq. yd. The walls to be 18 inches thick, and no allowance to be made for cornices, openings or partitions.

4. What amount will be due July 1st, 1892, on a note of \$80, drawn February 6th, 1892, and bearing interest at 5 $\frac{1}{4}$ per cent. per annum ?

5. What is the smallest sum of money with which you can buy chickens at 25c., or geese at 50c., or turkeys at 75c., or lambs at \$3, or sheep at \$5, or pigs at \$7, or cows at \$35, or horses at \$140, and have exactly \$15 left for expenses ?

6. A farmer agreed to pay his hired man ten sheep and \$160 for one year's labor. The man quit work at the end of seven months, receiving the sheep and \$60 as a fair settlement. Find the value of each sheep.

7. What decimal must be taken from the sum of 69 $\frac{1}{8}$, 8.2, 5.445, .065 and 20 $\frac{1}{12}$, so that it will contain 6.05 an exact number of times ?

8. A lad earned \$21.16 collecting accounts for a physician. He was allowed 5 $\frac{3}{4}$ per cent. ; what amount did he collect ?

9. S. S. No. 5, Esquensing, is assessed for \$150,000. The trustees have built a school-house costing \$1,800.

- (a) What will the school-house cost a ratepayer whose property is assessed for \$4,500 ?
- (b) What would be the *rate* of taxation per annum on the whole section if the house were paid for in six equal annual payments, without interest ?

PUBLIC SCHOOL LEAVING, 1892.

1. (a) What is meant by the prime factors of a number ?
- (b) Find the Prime Factors of 13230, 22050 and 23625, and
- (c) By means of the Prime Factors find their G. C. M. and L. C. M.

2. A man owned \$8,940 Bank Stock which paid a yearly dividend of $4\frac{1}{2}\%$. He sold out at $102\frac{3}{8}$ and invested the proceeds in Michigan Central Stock at $74\frac{3}{8}$ paying a yearly dividend of 3% . By how much was his yearly income changed by the transfer ?

3. Find the proceeds of the following note :—

\$2,400.00.

HAMILTON, February 3rd., 1892.

Five months after date, value received, I promise to pay Thomas Cowan, or order, the sum of Two Thousand Four Hundred Dollars, at Bank of Hamilton here, with interest at 6% per annum.

VANCE ALLEN.

Discounted May 22nd, 1892, at 7% .

(Year=366 days.)

4. A machinist sold two seed-drills for equal sums of money. He gained 25% on the one and lost 25% on the other. His total loss was \$9.60. Find the cost of each drill ?

5. A commission merchant sells a consignment of wheat for \$27,500, on a commission of $2\frac{1}{2}\%$. He pays \$250 for freight and storage, and with the net proceeds buys pork at \$6.25 per cwt., charging $2\frac{1}{2}\%$ for buying. How many cwt. of pork does he buy and what is the amount of his two commissions ?

6. Find the cost of the material required to fence $2\frac{1}{2}$ miles of railway (both sides), posts placed 8 feet apart, an 8 inch base 1 inch thick, a 2 x 4 rail at top, and 6 strands of wire. The posts cost $12\frac{1}{2}$ c. each, the lumber \$14 a thousand, and the wire 4c. per lb. (A lb. of wire stretches one rod.)

7. (a) A circular cistern, 8 feet in diameter and 9 feet in depth, is filled with water to the height of 6 feet. How many gallons of water in the cistern? (A cubic foot of water weighs 1,000 oz., and a gallon 10 lbs.)

(b) If a sphere whose diameter is 4 feet is submerged in the water in the cistern, how high will it cause the water to rise?

ANSWERS.

Exercise 1.

- | | | |
|--------------------------|----------------------------|---------------------------|
| 1. \$5.40. | 5. 36 days. | 9. $2\frac{7}{15}$ hours. |
| 2. \$240 | 6. $16\frac{32}{33}$ days. | 10. $23\frac{1}{3}$ days. |
| 3. $2\frac{6}{11}$ days. | 7. $21\frac{7}{11}$ days. | |
| 4. $3\frac{1}{2}$ days. | 8. $3\frac{1}{2}$ days. | |

Exercise 2.

- | | | |
|----------------------------|--|-----------------------|
| 1. $\frac{1}{7}$ of a day. | 5. 58 yards. | 8. \$2.40. |
| 2. $3\frac{1}{13}$ hours. | 6. $3\frac{9}{17}$ days. | 9. $2\frac{3}{4}$. |
| 3. $\frac{3}{8}$ of a day. | 7. A 60 cents, B 36 cents, C 12 cents. | 10. $15\frac{1}{4}$. |
| 4. 60. | | |

Exercise 3.

- | | | |
|---------------------------|-------------|---------------------------|
| 1. \$434. | 5. 8%. | 9. $12\frac{1}{2}$ years. |
| 2. \$146.25. | 6. \$1,000. | 10. 10%. |
| 3. $43\frac{3}{4}$ cents. | 7. 8 years. | |
| 4. \$5. | 8. \$50. | |

Exercise 4.

- | | | |
|---------------|--------------------------|----------|
| 1. 5 years. | 5. 5%. | 9. 6%. |
| 2. \$2.00. | 6. 4%. | 10. 11%. |
| 3. 31st July. | 7. \$4.12. | |
| 4. 319 days. | 8. $6\frac{1}{2}$ cents. | |

Exercise 5.

- | | | |
|------------|------------------------|-------------------------|
| 1. \$9.00. | 5. 12%. | 9. \$7.50. |
| 2. \$2.00. | 6. $11\frac{1}{8}\%$. | 10. $14\frac{1}{2}$ oz. |
| 3. \$5.00. | 7. 10%. | |
| 4. 30%. | 8. \$6,400. | |

Exercise 6.

- | | | |
|----------------------------|---------------------------|--------------|
| 1. $15\frac{5}{8}\%$ gain. | 5. $33\frac{1}{3}\%$. | 9. \$150. |
| 2. $47\frac{3}{10}$ cents. | 6. $1\frac{37}{63}\%$. | 10. \$10.50. |
| 3. \$20.25. | 7. $6\frac{1}{4}\%$ loss. | |
| 4. \$55. | 8. 28% . | |

Exercise 7.

- | | | |
|-----------------------------|-----------------------------|--------------------------|
| 1. 165. | 5. $\frac{1}{14}$ of a day. | 8. A, \$360; B, \$260; |
| 2. $26\frac{1}{4}$ seconds. | 6. (1) \$12.50 loss, (2) | C, \$220. |
| 3. \$11.52. | 4% loss. | 9. 480. |
| 4. \$36.46 $\frac{1}{8}$. | 7. 40% . | 10. $3\frac{2}{3}$ days. |

Exercise 8.

- | | | |
|----------|--|--|
| 1. 100. | 5. 58 turkeys, 42 geese. | 8. 25. |
| 2. \$60. | 6. A $5\frac{5}{8}$ cents, B $4\frac{13}{8}$ | 9. $41\frac{5}{11}$ and $56\frac{3}{11}$ af- |
| 3. 20. | cents. | ter 9 o'clock. |
| 4. 0. | 7. $2\frac{1}{2}$ days. | 10. \$91.20. |

Exercise 9.

- | | | |
|------------|---|-----------------|
| 1. 35. | 5. A $30\frac{1}{2}$ ac., B $43\frac{2}{3}$ | 8. \$203, \$29. |
| 2. 210. | ac., C $50\frac{1}{2}$ ac. | 9. 11.45 a.m. |
| 3. 10 lbs. | 6. \$40. | 10. 15% . |
| 4. \$30. | 7. $21\frac{9}{11}$ after 4 o'clock. | |

Exercise 10.

- | | | |
|-----------------------------|----------------------------|-------------------------|
| 1. 220. | 5. \$78.75. | 9. \$34.75. |
| 2. \$3,080. | 6. 41. | 10. $5\frac{40}{187}$. |
| 3. 315 rods | 7. $129\frac{1}{2}$ hours. | |
| 4. $195\frac{1}{15}$ acres. | 8. 33 times. | |

Exercise 11.

- | | | |
|-------------------------------|------------------------------|-----------------------------|
| 1. $2\frac{1}{2}$ days. | 5. $117\frac{9}{7}$ cents. | 9. $3\frac{99}{107}$ hours. |
| 2. \$256,960. | 6. $29\frac{39}{25}$ busheis | 10. \$3,000, \$600. |
| 3. 26 ft., $3\frac{5}{8}$ in. | 7. 146,730 minutes. | |
| 4. 840 grains. | 8. $7\frac{1}{8}$ days. | |

Exercise 12.

- | | | |
|----------------------------|--------------------------|------------------|
| 1. \$40,000. | 5. \$2.16+. | 9. 473. |
| 2. 154. | 6. 200,563. | 10. \$4,787.23+. |
| 3. \$7,500. | 7. $8\frac{1}{2}$ yards. | |
| 4. \$69.38 $\frac{1}{8}$. | 8. 44,000 feet. | |

Exercise 13.

- | | | |
|--------------------------|---------------|------------------------|
| 1. 476. | 5. 13,840. | 9. \$16,200. |
| 2. 81 gallons. | 6. \$90.78. | 10. $77\frac{1}{10}$. |
| 3. 1.346 $\frac{2}{5}$. | 7. 270 times. | |
| 4. \$3.85. | 8. 800. | |

Exercise 14.

- | | | |
|-----------------------------------|----------------------|-----------------------|
| 1. \$60,000. | 5. $15\frac{5}{8}$. | 9. 400 barrels. |
| 2. 102. | 6. $56\frac{1}{4}\%$ | 10. \$2,000, \$1,500, |
| 3. $144,451\frac{3}{1000}$ acres. | 7. 5. | \$1,200, \$1,300 |
| 4. 10,208 yards. | 8. 5,413+ bricks. | |

Exercise 15.

- | | | |
|----------------------------------|--|-------------|
| 1. \$131.25, \$56.25. | 5. $\frac{7}{11}$ hour, $3\frac{2}{11}$ miles. | 8. \$80. |
| 2. 4.80. | 6. $\frac{31}{8878}$ inches. | 9. \$45. |
| 3. $34\frac{3}{8}$ cubic inches. | 7. \$1,219.58 $\frac{3}{8}$, | 10. 14,789. |
| 4. 14 days. | \$609.79 $\frac{1}{8}$. | |

Exercise 16.

- | | | |
|---------------------------|-------------------------------------|---------------------------|
| 1. \$12.80. | 5. $3\frac{1}{2}$ feet. | 8. \$10.50. |
| 2. $40\frac{1}{2}$ miles. | 6. \$18.02, \$15.01 $\frac{2}{3}$, | 9. \$520. |
| 3. \$5,040. | \$12.01 $\frac{1}{8}$. | 10. 450; 25 $\frac{1}{2}$ |
| 4. $11\frac{1}{2}$ feet | 7. \$4,750. | |

Exercise 17.

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|------------------------|--------------------------|----------------------|
| 1. \$36,000. | 5. $\frac{1}{24}$. | 9. $4\frac{1}{3}\%$ |
| 2. 90 cents, 55 cents. | 6. 12. | 10. $7\frac{1}{2}\%$ |
| 3. 40 acres, \$6. | 7. 528. | |
| 4. \$3.36. | 8. The pair worth \$3.56 | |

Exercise 18.

- | | | |
|-----------------------------|------------------------|------------------------|
| 1. \$5 gain per cwt. | 5. 4 days. | 9. $7\frac{1}{5}$ lbs. |
| 2. $6\frac{2}{13}$ days. | 6. $31\frac{1}{4}\%$. | 10. \$7.35. |
| 3. 52 yards, 1 foot. | 7. 280. | |
| 4. $51\frac{3}{7}$ minutes. | 8. 96 ; 24. | |

Exercise 19.

- | | | |
|--------------------------------------|--|--------------------------|
| 1. A 45, B 90. | 5. \$15.38 $\frac{6}{13}$. | 9. 28 yards. |
| 2. \$500, \$1,500, \$2,000. | 6. 40%. | 10. $8\frac{2}{3}$ feet. |
| 3. $1\frac{1}{2}\frac{3}{4}$ inches. | 7. $35\frac{5}{8}$, $54\frac{1}{8}$, 40. | |
| 4. \$159.68 $\frac{3}{4}$. | 8. 2 men. | |

Exercise 20.

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|---------------------------|------------------------------|------------------------------|
| 1. 276. | 5. \$2.98 $\frac{172}{11}$. | 9. $11\frac{33}{167}$. |
| 2. \$36, \$60, \$57.60. | 6. $\frac{1}{8}$. | 10. \$8.51 $\frac{37}{17}$. |
| 3. $34\frac{8}{13}$ loss. | 7. 4, 8, 12. | |
| 4. \$481.68. | 8. $77\frac{1}{7}$ oranges. | |

Exercise 21.

- | | | |
|---------------------|-------------|----------------------|
| 1. 4,547. | 5. \$30.30. | 9. \$12.50. |
| 2. \$210.65 | 6. 2,000. | 10. $5\frac{1}{2}$. |
| 3. 14 hrs., 46 min. | 7. 4 cents. | |
| 4. 48 lbs. | 8. 8 hours. | |

Exercise 22.

- | | | |
|------------------------------|-------------------------------------|----------------------------------|
| 1. $454\frac{43}{60}$ times. | 5. 56 feet, 84 feet. | 8. $37\frac{5}{8}$ square yards. |
| 2. 100 acres. | 6. 120. | 9. $13\frac{1}{3}$ minutes. |
| 3. $206\frac{6}{13}$ lbs. | 7. $34'$, $27\frac{3}{31}"$ past 6 | 10. \$520. |
| 4. $\frac{1}{84}$. | o'clock p.m. | |

Exercise 23.

- | | | |
|--------------------------------|--------------|----------------------------|
| 1. \$1,018. | 5. \$33.35. | 9. \$90. |
| 2. 2 feet, 9 inches. | 6. 2 days. | 10. $52\frac{1}{2}$ cents, |
| 3. $10'$, $16\frac{1}{11}"$. | 7. 75 cents. | |
| 4. \$44. | 8. \$3.60. | |

Exercise 24.

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|-----------------------------|-----------------------|---|
| 1. 25%. | 5. \$500. | 9. \$125. |
| 2. \$1,900. | 6. $9\frac{1}{3}\%$. | 10. \$4 ; \$2.66 $\frac{2}{3}$; \$1.33 $\frac{1}{3}$. |
| 3. 16 days. | 7. 300, 180. | |
| 4. \$213.39 $\frac{1}{5}$. | 8. 9 tons. | |

Exercise 25.

- | | | |
|-----------------------------------|---------------------|-----------------------------|
| 1. \$5. | 5. 11 hrs., 38 min. | 9. 26 yards, 2 feet. |
| 2. 18%. | 6. 20 minutes. | 10. \$21.66 $\frac{2}{3}$. |
| 3. 11 hrs., 53 $\frac{3}{4}$ min. | 7. 3,420 steps. | |
| 4. 30 days. | 8. \$5,606.75. | |

Exercise 26.

- | | | |
|------------------------|---------------------------|--------------|
| 1. 48 minutes. | 5. 18 feet. | 9. 39 ; 21. |
| 2. \$2.10. | 6. 252. | 10. 56 feet. |
| 3. A 35 cts., B 5 cts. | 7. \$1.33. | |
| 4. 24,000. | 8. 633 $\frac{3}{8}$ lbs. | |

Exercise 27.

- | | | |
|----------------|-----------------------------|--------------|
| 1. \$3,907.02. | 5. \$210. | 9. 22 miles. |
| 2. \$46.08. | 6. 12 days. | 10. \$375. |
| 3. 314. | 7. 5 hours, 48 min. | |
| 4. \$30. | 8. \$160.87 $\frac{1}{2}$. | |

Exercise 28.

- | | | |
|-------------------------------------|------------------------|-----------------------------------|
| 1. 8 $\frac{11}{16}$ days. | 5. 31,239. | 9. 1,320 ; \$36.30. |
| 2. 5 $\frac{5}{11}$ past 1 o'clock. | 6. 7,283. | 10. 1 min., 1 $\frac{1}{2}$ secs. |
| 3. 325 yards. | 7. \$21,000. | |
| 4. \$30. | 8. 68 cents, 34 cents. | |

Exercise 29.

- | | | |
|--------------------|-------------------------|-------------------------------|
| 1. 7,724 ; 1,926. | 5. 70,560. | 8. $\frac{37}{5}$. |
| 2. \$32. | 6. 60. | 9. A \$4,334, B \$1,474, |
| 3. \$12.75 a year. | 7. Ship \$24,000, cargo | C \$3,080. |
| 4. 203. | \$36,000. | 10. 13 $\frac{1}{2}$ bushels. |

Exercise 30.

- | | | |
|----------------------------|----------------------------|-------------|
| 1. \$3.00. | 5. 23,805. | 9. 18 feet. |
| 2. $12\frac{3}{4}$ cords. | 6. \$81.31 $\frac{1}{2}$. | 10. \$180. |
| 3. \$38.84 $\frac{4}{5}$. | 7. \$47. | |
| 4. 3 men. | 8. 11,280 feet. | |

Exercise 31.

- | | | |
|---------------------------|----------------|--------------|
| 1. 1,980 pickets. | 5. 880 yards. | 9. \$508.50. |
| 2. \$118.80. | 6. 70 fields. | 10. \$1.25. |
| 3. $20\frac{5}{8}$ miles. | 7. \$1,267.20. | |
| 4. $2\frac{3}{8}$ mills. | 8. \$64. | |

Exercise 32.

- | | | |
|--|-----------------------------|---|
| 1. \$81.25. | 4. \$112.46 $\frac{2}{5}$. | 8. \$47.75. |
| 2. 12 horses, 36 cattle,
144 sheep. | 5. 50 feet. | 9. 165 acres. |
| 3. 2,310 feet. | 6. 816 bricks. | 10. 18 miles, 7 furlongs,
13 $\frac{7}{8}$ rods. |
| | 7. \$8,225 ; \$10,525. | |

Exercise 33.

- | | | |
|----------------------------|---------------------------|--|
| 1. 77 posts. | 5. $21\frac{1}{3}$ hours. | 9. 2 hours, 54 minutes,
47 $\frac{1}{2}$ seconds. |
| 2. 1,980. | 6. 236. | 10. 43,520. |
| 3. \$8.25. | 7. 3,689,243. | |
| 4. \$29.55 $\frac{5}{9}$. | 8. 60 miles. | |

Exercise 34.

- | | | |
|-----------------------|--------------|---------------|
| 1. $\frac{81}{256}$. | 5. 54. | 9. 2 seconds. |
| 2. 1,210 feet. | 6. 53 cents. | 10. 15 miles. |
| 3. 106. | 7. \$800. | |
| 4. 7,841 sods. | 8. \$5.25. | |

Exercise 35.

- | | | |
|-------------------------------------|----------------|---------------------------------------|
| 1. \$96. | 4. \$5.25. | 8. Quotient 2,230 ;
remainder 196. |
| 2. 150 yards. | 5. \$81.60. | 9. 76. |
| 3. 1 gold coin = 5 silver
coins. | 6. \$2,010.75. | 10. 60 eggs. |
| | 7. \$19.80. | |

Exercise 36.

- | | | |
|--|--------------------------|-----------------|
| 1. 700 feet. | 3. Quot. 438 ; rem. 470. | 7. 111. |
| 2. $4\frac{1}{2}$ hours with the stream, $7\frac{1}{2}$ hours against. | 4. $1\frac{1}{2}$ miles. | 8. \$145.52. |
| | 5. 33. | 9. 294. |
| | 6. 4 miles. | 10. 40 gallons. |

Exercise 37.

- | | | |
|----------------|-------------------|-----------------------------|
| 1. 28 miles. | 5. 14 apples. | 9. 100 lbs. at 96 cts. with |
| 2. 28 gallons. | 6. 1,386 pickets. | 80 lbs. at \$1.20. |
| 3. 250. | 7. \$529.20. | 10. 9 and 8. |
| 4. \$45.06. | 8. 4 days. | |

Exercise 38.

- | | | |
|-----------------------------|-----------------------------|-----------------------------|
| 1. 288 times. | 5. 7%. | 9. \$31.31 $\frac{9}{16}$. |
| 2. 2 o'clock. | 6. 32 feet. | 10. 400. |
| 3. \$12.35 $\frac{5}{17}$. | 7. \$34.20. | |
| 4. \$65. | 8. \$418.33 $\frac{1}{2}$. | |

Exercise 39.

- | | | |
|--------------------------|---|--|
| 1. 4 minutes. | 6. $5.59 +$ mls. to the in. | 9. A 88 cents ; B $49\frac{1}{2}$ cents. |
| 2. 120 yards. | 7. $6.17\frac{1}{2}$. | 10. $13\frac{1}{3}$ years. |
| 3. 2,097 lbs. | 8. B walks a mile in $13\frac{1}{4}$ minutes ; $\frac{4}{5}$ of a mile. | |
| 4. 1,619. | | |
| 5. $2\frac{1}{2}$ miles. | | |

Exercise 40.

- | | | |
|------------------------------------|-----------------------------|---|
| 1. 3 hours, 3 minutes, 36 seconds. | 5. \$42. | 9. $1\frac{7}{11}$ hours after departure last train ; |
| 2. $42\frac{2}{15}$ days. | 6. 15 times. | $49\frac{1}{11}$ miles from L. |
| 3. 54 days. | 7. 27,648. | 10. $11\frac{2}{3}$ days. |
| 4. $5\frac{3}{8}$ hours. | 8. $39\frac{17}{32}$ yards. | |

Exercise 41.

- | | | |
|---|------------------------|----------------------------|
| 1. 32 men. | 3. \$44 ; \$45 ; \$22. | 7. 4 min., 47 sec. |
| 2. $22\frac{1}{8}$ gals. water ; $1\frac{7}{8}$ wine ; $10\frac{1}{8}$ gals. wine ; $1\frac{7}{8}$ water. | 4. \$440. | 8. 42 miles. |
| | 5. 300 ; 402. | 9. 45 minutes. |
| | 6. \$1,045.44. | 10. $16\frac{2}{3}$ miles. |

Exercise 42.

- | | | |
|---------------------------|-----------------|--------------------------------------|
| 1. 154 $\frac{1}{2}$. | 5. 45° miles. | 9. 80 feet ; 63 feet. |
| 2. A, \$656 ; B, \$287. | 6. \$201.60. | 10. 20 $\frac{1}{2}$ yds. by 41 yds. |
| 3. 5 min., 30 sec. | 7. 5,000 lbs. | |
| 4. 26 $\frac{2}{3}$ days. | 8. \$10,093.75. | |

Exercise 43.

- | | | |
|----------------|-------------------------------------|-------------------------------------|
| 1. 76,250. | 5. 12 days. | 9. 2 acres, 3 roods, 36 |
| 2. \$2,715. | 6. \$8,050. | perches, 1 yard. |
| 3. \$15. | 7. 36 $\frac{5}{8}$ miles per hour. | 10. 4 $\frac{7}{8}$ miles per hour. |
| 4. 30 minutes. | 8. 9 miles, 110 yards. | |

Exercise 44.

- | | | |
|-------------------------------|--------------------------|--------------|
| 1. 500 barrels. | 5. 750 tons. | 8. 88 yards. |
| 2. 13 cents. | 6. In 8 hours ; 26 miles | 9. \$36.50. |
| 3. \$3,553.12 $\frac{1}{2}$. | from start. | 10. 160 lbs. |
| 4. \$1.56. | 7. 9 days. | |

Exercise 45.

- | | | |
|----------------|---------------------------------------|--------------|
| 1. 3267. | 5. 120 yds. ; 83 $\frac{1}{3}$ cents. | 9. 15%. |
| 2. \$400 loss. | 6. 3 $\frac{1}{4}$ days. | 10. \$81.27. |
| 3. 21,216. | 7. 18 cents ; 9 cents. | |
| 4. \$210. | 8. 2704, | |

Exercise 46.

- | | | |
|---------------------------|-------------------------------|----------------------------|
| 1. \$3.93 $\frac{3}{4}$. | 4. 28 $\frac{4}{5}$ yards. | 8. $\frac{3}{5}$ of a day. |
| 2. 8 lbs. coffee to 25 | 5. 19 $\frac{80}{125}$ cents. | 9. 75 cents. |
| lbs. chicory. | 6. 13 $\frac{5}{7}$ cents. | 10. 25 ; 541 ; 16. |
| 3. 18 feet. | 7. 14 gallons. | |

Exercise 47.

- | | | |
|--------------------------------------|---------------------------|----------------------------|
| 1. 80 feet. | 4. 450 miles. | 8. \$4,500. |
| 2. \$8.00 ; \$9.24. | 5. 2 $\frac{1}{2}$ days. | 9. 1 $\frac{9}{17}$ hours. |
| 3. 17 $\frac{18}{187}$ minutes to 12 | 6. A, 75 ; B, 50 ; C, 25. | 10. 3 miles an hour. |
| Saturday night. | 7. 3 $\frac{1}{2}$ days. | |

Exercise 48.

- | | | |
|--------------------------------|---------------------------|-------------------------|
| 1. 36. | 5. $84\frac{2}{7}$ cents. | 8. 4 yards ; 4·97 yards |
| 2. $57\frac{2}{7}$ rods. | 6. 20 gallons. | would make their |
| 3. 120 sheep. | 7. 14 oz. | chances equal. |
| 4. $\frac{1}{100}$ of an inch. | | 9. 60 cents ; 20 cents. |
| | | 10. \$1.32. |

Exercise 49.

- | | | |
|---------------|---------------------------|-----------------------------|
| 1. 80 cents. | 5. 4 hours, 48 minutes. | 9. $23\frac{3}{4}\%$. |
| 2. 880 yards. | 6. 36 yards. | 10. $15\frac{1}{3}$ ounces. |
| 3. 48 yards. | 7. $27\frac{1}{2}$ yards. | |
| 4. 12 miles. | 8. 12 days. | |

Exercise 50.

- | | | |
|----------------|---------------------------|-------------|
| 1. \$29. | 5. 8 cents a yard. | 9. \$4.50. |
| 2. 40 cents. | 6. 90 yards. | 10. 6 boys. |
| 3. 55 cents. | 7. $\frac{1}{3}$. | |
| 4. 30 barrels. | 8. \$870 ; \$840 ; \$290. | |

Exercise 51.

- | | | |
|-----------------------------|----------------------------|------------------------------|
| 1. \$325. | 5. $4\frac{1}{4}$ yards. | 8. \$24.32 $\frac{1}{8}$. |
| 2. $\frac{1}{4}$. | 6. $80\frac{1}{4}$ cents. | 9. $\frac{1}{3}$ of an hour. |
| 3. 630 acres. | 7. A, \$1,875; B, \$2,475; | 10. \$2.22 $\frac{2}{3}$. |
| 4. \$1.21 $\frac{3}{100}$. | C, \$3,150; D, \$3,000. | |

Exercise 52.

- | | | |
|---------------------------|------------------------|----------------------------|
| 1. 150 gallons. | 5. \$10,000 ; \$4,000. | 9. 22 $\frac{1}{2}$ days. |
| 2. \$28,350. | 6. 5 hours. | 10. 16 $\frac{1}{2}$ feet. |
| 3. \$5.06 $\frac{1}{2}$. | 7. 150 feet. | |
| 4. 16 years. | 8. \$506.88. | |

Exercise 53.

- | | | |
|---------------------------|----------------|-----------------------|
| 1. \$16,809. | 5. 4 feet. | 9. 10 yards in 100. |
| 2. 300 barrels. | 6. 30 minutes. | 10. 80 lbs. ; 10 lbs. |
| 3. $6\frac{1}{4}\%$. | 7. \$4.08. | |
| 4. 7 $\frac{1}{2}$ acres. | 8. 15 years. | |

Exercise 54.

- | | | |
|--------------------------------|-------------------------------|------------|
| 1. $62\frac{1}{2}$ cents. | 5. 16 bushels. | 9. \$2.00. |
| 2. $\frac{1}{2}$ mile an hour. | 6. $19\frac{1}{4}$ days | 10. \$200. |
| 3. 150 ; 100. | 7. $15\frac{1}{2}\%$. | |
| 4. $68\frac{1}{4}$ yards. | 8. \$118,181 $\frac{1}{11}$. | |

Exercise 55.

- | | | |
|---------------------|------------------------------------|-----------------------------|
| 1. \$100. | 5. $26\frac{3}{4}$ cents a pound . | 9. \$329.67. |
| 2. \$303.75. | 6. 9,100 square yards. | 10. $6\frac{1}{8}$ gallons. |
| 3. \$40. | 7. 5,952 stones. | |
| 4. \$480 ; 6 years. | 8. 6 tons, 1,125 lbs. | |

Exercise 56.

- | | | |
|--|----------------------------|-----------------------|
| 1. \$15.60. | 4. $6\frac{2}{3}$ hours. | 8. 132 trees. |
| 2. \$12.25. | 5. \$15. | 9. $8\frac{3}{8}\%$. |
| 3. $8\frac{3}{11}$ minutes after
1 o'clock ; $2\frac{2}{11}$
minutes after 1
o'clock. | 6. 2,528. | 10. \$215. |
| | 7. \$1,666 $\frac{2}{3}$. | |

Exercise 57.

- | | | |
|------------------------------|--------------------------|-----------------------|
| 1. $\frac{1}{7}$ of an inch. | 5. 60 cents. | 9. $1\frac{1}{2}\%$. |
| 2. $101\frac{2}{3}$ lbs. | 6. A, 20 cts. ; B, 5 cts | 10. 30 rods. |
| 3. \$9,600. | 7. \$150. | |
| 4. 40%. | 8. \$210. | |

Exercise 58.

- | | | |
|----------------|--------------------------|---------------------|
| 1. \$387.50. | 5. \$23.65. | 9. 112 yards. |
| 2. \$9.80. | 6. \$235. | 10. 8 double-rolls. |
| 3. \$3,062.50. | 7. Four mills on the \$. | |
| 4. \$174.83. | 8. \$109.44. | |

Exercise 59.

- | | | |
|-----------------------|----------------------------|--------------|
| 1. $1\frac{1}{3}\%$. | 5. $\frac{3}{4}$ of a day. | 9. 4 days. |
| 2. 4%. | 6. \$4.96 ; \$2.18. | 10. \$2,400. |
| 3. 12 yards. | 7. 50 cents ; 20 cents. | |
| 4. \$6.30. | 8. \$68. | |

Exercise 60.

- | | | |
|---------------------------------|------------------------------|--------------|
| 1. \$4.50. | 4. \$17.50 | 8. 42 cents. |
| 2. \$286. | 5. \$4.68 $\frac{3}{4}$. | 9. 525. |
| 3. 35 lbs. tea ; 20 lbs. sugar. | 6. $\frac{1}{4}$. | 10. \$1,518. |
| | 7. 686 $\frac{7}{100}$ tons. | |

ADMISSION TO HIGH SCHOOLS.*July, 1880.*

- | | | |
|--|--------------------------------------|--|
| 1. Book-work | 4. 104,448 bricks. | 7. 70 dozen. |
| 2. Book-work ; 13. | 5. \$1133.79 $\frac{5}{8}$. | 8. 43 $\frac{67}{100}$ miles. |
| 3. Book-work ; 1 $\frac{1}{2}$ $\frac{6}{10}$ $\frac{6}{10}$ $\frac{1}{4}$ $\frac{1}{5}$. | 6. 830,000. | 9. 68 $\frac{1}{2}$ ft. and 51 $\frac{1}{2}$ ft. |
| 10. A and B can do $1\frac{3}{4}$ or $\frac{4}{3}$ in 1 day. | | |
| B and C | " $1\frac{1}{10}$ or $\frac{10}{9}$ | " |
| A and C | " $1\frac{1}{15}$ or $\frac{15}{13}$ | " |

2 A, B and C can do $\frac{4}{3} + \frac{10}{9} + \frac{15}{13} - \frac{421}{117}$ of work in 1 day,
 and A, B and C " $\frac{1}{2}$ of $\frac{421}{117} = \frac{421}{234}$ " "
 then A, B and C " $\frac{1}{234}$ of work in $\frac{1}{2}$ of a day
 and $\frac{234}{234}$ " " $\frac{234}{234}$ "

December, 1880.

- | | | |
|-----------------------|-------------------------------|-------------------------------|
| 1. Book-work. | 4. \$13.56 $\frac{7}{8}$. | 7. \$2,501.52 $\frac{1}{4}$. |
| 2. 9187. | 5. 61 $\frac{8917}{100000}$. | |
| 3. 178 ounces nearly. | 6. 53,625 lbs. | |

July, 1881.

- | | |
|---|-----------------------------------|
| 1. Book-work ; 31,622,777. | 4. 110 $\frac{23}{100}$. |
| 2. Book-work ; $2 \times 2 \times 2 \times 2 \times 2 \times$
$2 \times 3 \times 13 \times 53 ; 2 \times 2 \times 2 \times 2 \times$
$2 \times 2 \times 3 \times 13 \times 43 ; 5,688,384.$ | 5. \$1.30 $\frac{119}{100}$. |
| 3. 73,590 minutes. | 6. 615.07 + ; $\frac{285}{100}$. |
| | 7. 7,008,750 cubic feet. |

December, 1881.

1. 351,526,239.2 +
2. $31\frac{1}{2}$
3. \$356.30 $\frac{1}{2}$.
4. A certain mass of lead weighs $11\frac{1}{2}$ times an equal bulk of water; the same mass of platinum weighs 21 times an equal bulk of water, \therefore platinum is $\frac{21}{11\frac{1}{2}} = 1\frac{1}{3}$ times the weight of an equal bulk of lead. Then a mass of platinum the size of a mass of lead weighing 56 lbs., will weigh $1\frac{1}{3}$ times 56 lbs. = $103\frac{1}{3}$ lbs.
5. 182s.
6. \$2.72.
7. $\frac{1}{4}$ of an inch.
8. 40,960.
9. $33\frac{1}{3}\%$.

June, 1882.

1. Book-work ; prime.
2. \$63.16 $\frac{1}{2}$.
3. Book-work ; $\frac{8}{18\frac{1}{2}}$.
4. Book-work.
5. 18 miles.
6. 3 inches.
7. \$1,142.28.
8. 16,000 acres.
9. 3 days.
10. 300.

December, 1882.

1. Book-work ; $7,485\frac{1440}{10000}$.
2. \$12.60 $\frac{1}{2}$.
3. 49,896 ; prime.
4. Book-work ; $\frac{1}{4}$.
5. Book-work.
6. 7 acres, 1 rood, 6 square perches, 21 square yards, 7 square feet, 20 square inches.
7. $21\frac{0}{8}$ feet.
8. When A runs at $\frac{4}{5}$ of his speed, he runs 1,760 yards while B runs 1,760 yards - 22 yards = 1,738 yards. But if $\frac{4}{5}$ of his rate = 1,760 yards, his rate = 1,320 yards; for if $\frac{4}{5}$ of it = 1,760 yards, then $\frac{1}{5}$ = 440 yards and $\frac{3}{5}$, or the whole = 3×440 yards = 1,320 yards. \therefore A only runs 1,320 yards while B runs 1,738 yards, or A's rate is to B's as 60 is to 79.
9. $21\frac{4}{5}$ hours.
10. 90 cents.

June, 1883.

1. Book-work.
2. Book-work.
3. \$29,027.84 $\frac{1}{8}$.
4. \$319.37 $\frac{1}{2}$.
5. $\frac{314513}{362880}$; $\frac{441}{3760}$.
6. $133\frac{1}{3}$; 100 ; 134.
7. \$3.56 $\frac{1}{5}$.
8. \$5.25.
9. .00421.
10. $21\frac{8}{11}$ ' after 4 ; $5\frac{5}{11}$ ' and $38\frac{2}{11}$ ' after 4.

December, 1883.

1. Book-work.
2. \$36.08.
3. Not so ; $9\frac{2}{3}$ times.
4. \$508 ; \$438 ; \$254.
5. 15.
6. .001499+.
7. \$14.56.
8. Since it takes B 6 minutes to run the whole course, A may allow him 1 minute of a start in time or $\frac{1,760 \text{ yards}}{6} = 293\frac{1}{3}$ yards in distance.
9. $\frac{1}{4}$.
10. \$4.81+.

June, 1884.

1. 7,070.
2. 149,688 ; 119.
3. .00278+.
4. $7\frac{2}{3}\frac{1}{2}$; $\frac{1}{7}$.
5. \$8.76.
6. $1\frac{3}{4}\frac{5}{11}\frac{2}{10}\frac{1}{4}$ lbs.
7. $28\frac{4}{5}$; 36 ; 48.
8. 5,000.
9. \$110.88.
10. \$24.04+ ; \$240 ; $\frac{2}{3}\%$.

December, 1884.

1. 80,407,089.
2. 221.
3. \$126.80 $\frac{2}{3}\frac{3}{4}$.
4. (a) $22\frac{2}{3}\frac{3}{4}$;
(b) $\frac{2}{2}\frac{6}{7}\frac{6}{5}\frac{1}{6}\frac{6}{8}\frac{8}{0}\frac{0}{0}\frac{0}{0}$.
5. $11\frac{1}{2}$ feet.
6. 7 days.
7. $25\frac{5}{9}$ gallons.
8. \$19.16.
9. 4 hours, 24 minutes, or 4 hours, $19\frac{7}{11}$ minutes.

June, 1885.

1. Book-work.
2. $\frac{1}{3}\frac{2}{7}\frac{6}{2}\frac{1}{2}$.
3. 28.89927017.
4. \$93.39 $\frac{1}{2}$.
5. $8\frac{1}{4}$ cents.
6. \$13.83 $\frac{3}{4}$.
7. $16\frac{2}{3}$ years.
8. \$266 $\frac{2}{3}$; \$933 $\frac{1}{3}$.
9. $16\frac{1}{11}$ after 3 ; $13\frac{1}{11}$ after 3.
10. \$720 less what he spends + $7\frac{1}{2}$ times what he spends = \$1,305. Then \$720 together with $6\frac{1}{2}$ times what he spends = \$1,305 \therefore $6\frac{1}{2}$ times what he spends = \$1,305 - \$720 = \$585, and once what he spends = \$585 \div $6\frac{1}{2}$ = \$90.

December, 1885.

1. 2, 3, 5, 7, 11.
2. $\frac{14}{3}$; 28, 152.
3. \$1,890.
4. $5\frac{1}{4}$.
5. .000372.
6. \$323.12 $\frac{1}{2}$.
7. A yard ; a day ; a sovereign.
8. \$132.
9. 4 hours.

July, 1886.

- | | | |
|--|-------------------------|-----------------------------|
| 1. 12,540,280 $\frac{1}{2}$, 478,969. | 4. \$14; 30 of each. | 7. $\frac{1}{10}$. |
| 2. \$69.08. | 5. \$2,000; 8%. | 8. 10 $\frac{1}{11}$ yards. |
| 3. \$526.70. | 6. \$424; \$364; \$212. | |

December, 1886.

- | | |
|----------------------------|-----------------------------------|
| 1. 52 times. | 9 \$9.90. |
| 2. .0001. | 10. A number is exactly divisible |
| 3. 1 $\frac{1}{2}$ miles. | by 9 if the sum of its digits |
| 4. \$37.50. | is divisible by 9 without |
| 5. 30 cows. | leaving a remainder. |
| 6. 5 years. | 11. 84 lbs. |
| 7. 27 cents. | 12. \$60. |
| 8. 12 $\frac{1}{2}$ years. | |

July, 1887.

- | | | |
|-------------|-----------------------------|----------------------------|
| 1. 354,025. | 4. $\frac{3}{5}$. | 7. \$250 loss. |
| 2. \$300. | 5. \$685.71 $\frac{3}{4}$. | 8. 8 $\frac{2}{3}$ months. |
| 3. \$1,000. | 6. 12 pounds. | 9. 6 $\frac{1}{4}$ %. |

December, 1887.

- | | | |
|-----------------|-------------------------------|----------------------|
| 1. 205. | 5. 2,560 acres. | 9. 4,928 cubic feet. |
| 2. 2,700 miles. | 6. First man; \$27. | 10. \$1,200; \$900. |
| 3. \$3.00. | 7. 909 $\frac{1}{11}$ ounces. | 11. 779.01 gallons. |
| 4. \$700. | 8. \$720. | |

July, 1888.

- | | | |
|---|---------------------|-------------------|
| 1. Book-work. | 4. \$412,500. | 8. 24 r. by 18 r. |
| 2. 190 $\frac{2}{3}$. | 5. \$240. | 9. \$12,937.50. |
| 3. 10.52 p.m.; 246 $\frac{2}{3}$ miles. | 6. 14,580 shingles. | |
| | 7. 12 men. | |

December, 1888.

- | | | |
|----------------------|------------------------|------------------------------------|
| 1. \$1,169.35. | 4. \$15.67+. | 7. \$17.50. |
| 2. \$2.80. | 5. 33 $\frac{1}{3}$ %. | 8. 307 $\frac{1}{2}$ square yards. |
| 3. \$56.70; \$25.90. | 6. 3,627 cords. | |

July, 1889.

- | | | |
|-----------------------------|-------------------------|--------------|
| 1. 70. | 4. $4\frac{2}{3}$ feet. | 7. \$43.75. |
| 2. \$116.81 $\frac{2}{3}$. | 5. 13,310. | 8. \$448.80. |
| 3. 24 miles. | 6. 60,480. acres. | |

December, 1889.

- | | | |
|-----------------------------|-----------------------------|--|
| 1. 80 cents. | 4. \$349.71 $\frac{2}{3}$. | 7. \$2 20. |
| 2. \$9.18 nearly. | 5. \$320. | 8. \$4,076.16 $\frac{2}{3}$. $5\frac{2}{3}$ |
| 3. 541 $\frac{2}{3}$ miles. | 6. 169 $\frac{1}{3}$ yards. | 9. 20 + %. |

July, 1890.

- | | | |
|-------------------------------------|--------------------------|--------------|
| 1. \$2,213.47. | 4. \$158.40 ; \$105 60 ; | 7. 10 years. |
| 2. 9 years. | \$66.00. | 8. 60 days. |
| 3. 4,888 $\frac{2}{3}$ cubic yards. | 5. \$67.20. | 9. 20 miles |
| | 6. \$18.47 + . | |

December, 1890.

- | | |
|---|----------------------------|
| 1. \$2,495.08. | 6. \$440. |
| 2. 100 acres. | 7. \$23.25. |
| 3. 11 cents. | 8. 5 $\frac{1}{3}$ %. |
| 4. 21 $\frac{7}{8}$ miles from K. ; 5 $\frac{5}{14}$ miles. | 9. The merchant ; 50 cents |
| 5. \$179.22 + . | |

June, 1891.

- | | | |
|---------------|------------------------------------|----------------|
| 1. Book-work. | 4. $\frac{7}{8}$ acre. | 7. 100 ; 75. |
| 2. \$392 40. | 5. 2,000. | 8. \$80. |
| 3. 44 %. | 6. \$2,500 ; \$3,000 ;
\$4,000. | 9. 80c. due B. |

June, 1892.

- | | | |
|--------------------------------|------------------------------|------------------------|
| 1. Book-work. | 4. \$81.67 $\frac{33}{81}$. | 7. .11. |
| 2. (a) \$3.49 $\frac{1}{11}$; | 5. \$435.00. | 8. \$368. |
| (b) \$3.43 $\frac{3}{4}$. | 6. \$8. | 9. (a) \$54 ; |
| 3. \$49.60. | | (b) 2 mills on the \$. |

HIGH SCHOOL ENTRANCE, 1893.

1. A farmer exchanges $3\frac{3}{5}$ tons of wheat at $64\frac{1}{2}$ c. a bushel for coal at \$6.75 per ton. How many lbs. of coal does he get?

2. Nathan Curd sells you 752 lbs. of cheese at $11\frac{3}{4}$ c. per lb., and receives the following goods: (Make out the account in your own name with place and date of this examination.)

11 yds. Silk @ \$2.25.
 400 lbs. Sugar at $4\frac{7}{8}$ c.
 12 lbs. Raisins at 11c.
 96 lbs. Nails at $3\frac{5}{8}$ c.
 56 yds. Grey Cotton @ $9\frac{3}{8}$ c.
 11 yds. White Cotton @ 10c.
 3 prs. Gloves @ 75c.

3. A school room is 30 ft. long, 24 ft. wide and 10 ft. high above the wainscotting. The trustees pay \$20 per thousand for a new floor; \$15 per thousand for a new board ceiling; 10c. per sq. yd. for painting the ceiling; 4c. per sq. yd. for tinting the walls, and \$2 per day for 6 days' labor. Find the total cost.

4. To drain a swamp in Dereham the Township Council had a ditch dug one mile long, 3 ft. deep, 6 ft. wide at the surface and 4 ft. wide at the bottom. Find total cost at 9 cents per cubic yd.

5. How many miles must be travelled by a team in ploughing lengthwise a piece of land 60 rods long and 40 rods wide, if each furrow is 10 inches wide?

6. Bought a horse for \$160 and gave in payment my note dated August 15th, 1892, with interest at $7\frac{1}{2}$ per cent. per annum until paid. On Jan. 8th, 1893, I sold the horse for \$200 cash and paid my note. What was my net gain?

7. A grocer receives \$9.60 for a bill of goods weighed on scales that gave only $15\frac{1}{4}$ ounces to the lb. How many cents' worth did he cheat his customer?

8. The outfit of a livery stable is worth \$3000. One-seventh the value of the horses is equal to one-fifth the value of vehicles, harness, etc. Find the value of the horses.

1893.

- | | |
|-------------------------------------|-----------------------------|
| 1. 22933 $\frac{1}{3}$ pounds. | 5. 148 $\frac{1}{2}$ miles. |
| 2. Balance in Curd's favor, \$30.71 | 6. \$35.20. |
| 3. \$50. | 7. 45 cents. |
| 4. \$264. | 8. \$1750. |

PUBLIC SCHOOL LEAVING, 1893.

1. (a) What is meant by a common multiple of two or more fractions ?

(b) Find the L. C. M. of $2\frac{1}{4}$, $3\frac{3}{8}$, $3\frac{9}{32}$, $14\frac{9}{14}$.

2. Express in decimals accurately to seven places :

$$\frac{1}{5} + \frac{1}{3 \times 5^3} + \frac{1}{5 \times 5^5} + \frac{1}{7 \times 5^7}$$

3. A boy can run six times around a circular plot of ground in 52 seconds, another boy can run nine times around the same plot in 80 seconds. If they start from the same place at the same time, and run in the same direction, how many rounds will each make before the faster boy overtakes the slower ?

4. A clerk pays \$7.50 taxes on his salary. What is his total salary if \$400 of it is exempt from taxation and a $2\frac{1}{2}\%$ rate is levied on the remainder ?

5. A miller bought 20,000 bushels of wheat and had it insured for $\frac{4}{5}$ of its cost, at $1\frac{1}{16}\%$, paying a premium of \$136. At what price per bushel must he sell it to gain 20% ?

6. For what sum must a note be drawn on June 1st, 1893, payable in 90 days, so that when discounted on June 14th at 8% the proceeds will be \$717.20 ?

7. I own \$6,000 of Bank Stock, paying an annual dividend of 5%. How much will my annual revenue from the Bank Stock be reduced by selling enough of it at 72 to pay a note of \$3735 nine months before it is due, reckoning true discount at 5% per annum ?

8. Charging interest at 6%, what sum is due to-day (June 29th), on the following ledger account :

Dr.

		\$	c.
1893			
Jan. 12	To Mdse., 30 days	130	00
Feb. 6	“ 60 days	180	00
Mar. 8	“ 90 days	460	00
April 4	“ 30 days	362	00
May 12	To Cash	160	00

Cr.

1893		\$	c.
Feb. 18	By Cash	100	00
April 20	“	150	00
June 24	“	312	00

9. A square plot of ground that contains $\frac{9}{40}$ of an acre is covered with cordwood (4 ft. long) to an average height of 12 ft. What is the wood worth at \$4.12 a cord?

10. A town lot containing $\frac{1}{5}$ of an acre is 4 rods wide. Find the total cost of the material for a picket fence around it of inch pickets 2" wide and 3' long, placed 2" apart, two stringers 2"x4", and an inch base 14" wide, the lumber being worth \$16 per M, board measure; posts 8 ft. 3 in. from centre to centre at 13 cents each; nails \$1.15.

32.735-

216

ENTRANCE ARITHMETIC, 1894.

1. Make out in proper form and find the amount of the following bill :—

June 1st, 1894.

G. Murray & Co. sold to John Scott, Toronto, 4886 bus. 36 lbs. Wheat, at 58c. a bus. ; 4532 lbs. Peas, at 52c. a bus. ; 38 lbs., 3 pks. Barley, at 54c. a bus. ; 465 lbs. Flour, at \$1.50 a cwt. ; 4685 lbs. Bran, at \$15 a ton. Write out a receipt in full for payment of account, 26th June.

2. The weight of a cubic foot of water is $62\frac{1}{2}$ lbs., and an imperial gallon contains 277.274 cubic inches, find the weight in ounces of a pint of water.

3. The Manufacturers' and Liberal Arts Building of the Columbian Fair was in the form of a rectangle and covered an area of 30 acres, 76 rods, 19 yds., 7 feet. The building was 787 feet wide. How many feet in length was it?

4. How many oranges must a boy buy and sell to make a profit of \$9.30, if he buys at the rate of 5 for 3 cents and sells at the rate of 4 for 3 cents?

5. A sells goods to B at a gain of 12 per cent. and B sells the same goods to C at a gain of $7\frac{1}{2}$ per cent. ; C paid \$3762.50 for the goods. How much did A pay for them?

6. A gravel-bed, whose surface has an area of 4 acres, contains gravel to an average depth of 6 feet. How many miles of road 11 feet wide can be covered from the gravel in the bed, if it be spread on to a uniform depth of 8 inches?

7. On the 15th October, 1893, a young man deposited in the Savings Bank the sum of \$860.75. On the 20th May, 1894, he withdrew the principal and simple interest at 4 per cent. per annum. What amount did he withdraw?

8. A man spent $\frac{5}{9}$ of his money for a house, $\frac{3}{7}$ of the remainder for cattle, and the rest for a farm. If the farm cost him \$357 less than house and cattle together, what did he pay for all?

9. (a) Simplify :

$$\frac{\frac{5}{14} - (\frac{3}{7} \text{ of } \frac{1}{2})}{\frac{5}{18} + (\frac{7}{12} \text{ of } 3\frac{1}{4}) - (\frac{7}{8} \text{ of } 1\frac{1}{2}\frac{6}{1}) - \frac{1}{3}} \div \frac{(\frac{1}{3} \text{ of } \frac{1}{2}) + (1\frac{1}{2} \text{ of } 5)}{9\frac{1}{3} - 1\frac{2}{3}}.$$

(b) Multiply 350.4 by .0105 and divide the product by .0000219,

ENTRANCE ARITHMETIC, 1895.

1. (a) Make out the following account neatly, accurately and in proper form. All fractions are to be retained :

John Wilson bought from you to-day :

7½ lbs. Cheese at 12½c. per lb.

6¼ lbs. Butter at 23c. per lb.

2½ lbs. Tea at 55c. per lb.

27 lbs. Sugar at \$1 per 12 lbs.

(b) He paid you cash and you allowed him 5 per cent. off.

(c) Receipt the account.

2. Find the simple interest on \$912.50 at 8 per cent. from 13th February, 1893, to 19th December, 1894. (Year equals 365 days.)

3. A farmer sold a load of barley, weighing 2712 lbs., when barley was 40 cents per bush. In weighing the grain the dealer made a mistake and took it as rye and paid for it at 49 cents per bushel. How much did the farmer gain or lose by the mistake?

4. A cord of wood and 100 bushels of grain fill equal spaces. A cubic bin whose edge is 12 feet contains 49,500 lbs. of grain. Find the weight of one bushel of this grain.

5. Find the expense of sodding a plot of ground, which is 40 yards long and 100 feet wide, with sods each a yard in length and a foot in breadth; the sods when laid costing 75 cents per hundred.

6. A can walk $3\frac{1}{3}$ miles in 50 minutes, and B can walk $2\frac{1}{4}$ miles in 36 minutes. How many yards will A be ahead of B when A has gone 6 miles, if they start together?

7. A can do a piece of work in $\frac{2}{3}$ of a day and B in $\frac{1}{2}$ of a day. In what time can both together do it? If \$1.40 be paid for the work, how much should A receive?

8. Simplify: $3\frac{1}{2} + \frac{2\frac{1}{2} - \frac{1}{8}}{2\frac{1}{2} + \frac{1}{8}} - \frac{7}{10}$ of $3\frac{1}{3} - \frac{5}{8}$, and divide 6 by .000725 correct to four decimal places.

PUBLIC SCHOOL LEAVING, 1894.

ARITHMETIC AND MENSURATION.

1. Resolve 16335 and 18018 into their prime factors, and from inspection of these write the prime factors of their (a) L. C. M. and (b) G. C. M.

2. Express in the form of a vulgar fraction the average of $\frac{3}{8}$, $\frac{3}{14}$, $\frac{4}{9}$, and $.486\frac{1}{3}$.

3. A man bought a bankrupt stock at 60c. on the \$ of the invoice price, which was \$4840. He sold half of it at 10 per cent. advance on invoice price, half the remainder at 20 per cent. below invoice price, and the balance at 50 per cent. of invoice price. His expenses were 10 per cent. of his investment. Find his loss or gain (a) in money and (b) in rate per cent.

4. A storekeeper on the 1st of March, 1894, bought goods amounting, at catalogue prices, to \$840, on which he was allowed successive discounts of $33\frac{1}{3}$ per cent. and 5 per cent. The account is payable in 60 days, after which time interest is to be charged at 7 per cent. per annum. On the 1st June, 1894, he paid \$100. How much is due on the 1st of July, 1894?

5. A farmer bought 80 acres on the 1st of Dec., 1893, for \$3600, payable one-third cash, one-fourth on the 1st of February, 1894, and the balance on the 1st of June, 1894. Find the equated time for the payment if made in one sum.

6. M invested money in 3 per cent. consolidated stock at 95 and an equal sum in factory stock at 190, paying an annual dividend of 7 per cent. From the latter he received ten dollars a year more than from the former. How many fifty-dollar shares of factory stock did he purchase?

7. A circular cistern is to contain 66 barrels and to be 6 feet deep. Find the diameter of the excavation, allowing for a brick lining 5 inches thick. (Note.—1 bbl. = $31\frac{1}{2}$ gal.; 1 cu. ft. = $24\frac{2}{5}$ quarts.)

8. In a granary there are four bins, each 10 feet long and 5 ft. wide; how high must they be boarded in front to be capable of holding 860 bushels? (See note after No. 7.)

9. Find the number of cubic feet in a hewn log, 12 inches square at one end and $9\frac{3}{4}$ inches square at the other, its length being 27 feet.

PUBLIC SCHOOL LEAVING.

ARITHMETIC AND MENSURATION.

June, 1895.

1. (a) Resolve 34650 and 43890 into their prime factors, and from inspection of these write in prime factors :

(i) their L. C. M. and G. C. M.

(ii) the quotient when the second number is divided by the first.

(b) Simplify :

$$(i) \quad \left(\frac{\frac{1}{2} - \frac{1}{3}}{\frac{1}{2} + \frac{1}{3}} + \frac{\frac{1}{3} - \frac{1}{4}}{\frac{1}{3} + \frac{1}{4}} \right) \div \left(\frac{\frac{1}{4} - \frac{1}{6}}{\frac{1}{4} + \frac{1}{6}} - \frac{\frac{1}{6} - \frac{1}{8}}{\frac{1}{6} + \frac{1}{8}} \right)$$

$$(ii) \quad \frac{.5 - .3}{.5 + .3} + \frac{.83 + .2}{.75 - .125}.$$

2. A bookseller gives a discount of 5 per cent. for cash, and allows teachers a second discount of 10 per cent. on all cash prices. A teacher paid \$5.13 for a book : what is the marked price ?

3. What is the value of a house if the insurance premium of $\frac{3}{4}$ per cent. on $\frac{2}{3}$ of its value, including 50 cents for the policy, equals \$6.50 ?

4. A and B entered into a partnership to carry on a mercantile business for one year. A put in \$900 at first and at the end of 4 months withdrew \$300. B put in \$600 at first and at the end of 4 months put in \$300 more. They gained \$3000. What was each one's share of the gain ?

5. \$1200.

Toronto, Oct. 12th, 1892.

One year from date we promise to pay John Smith, or order, twelve hundred dollars, with interest at 6 per cent. per annum.

Brown & Jones.

Endorsed as follows :—Oct. 15th, 1893, \$1000 ; April 15th, 1894, \$200. How much remained due Oct. 15th, 1894 ? (Reckon the time in months.)

6. A retired farmer invests 40 per cent. of his capital in $3\frac{1}{2}$ per cent. stock at 90, and the remainder in 4 per cent. stock at 95 : his income is \$698 per year. What capital has he invested ?

7. The base of an isosceles triangle is 20 feet, and each of the two equal sides is $15\frac{1}{2}$ feet. What is the altitude of the triangle ?

8. A man can run the length of the diagonal of a rectangular field containing 6 acres whose sides are as 5 to 12 in $3\frac{1}{4}$ minutes : find his rate of working in miles per hour.

ANSWERS.

June, 1894.

- | | |
|-------------------------------|------------------------------------|
| 1. \$2916.45 $\frac{1}{80}$. | 6. 27 miles. |
| 2. 20.05 + oz. | 7. \$881.21 +. |
| 3. 1687 ft. | 8. \$2261. |
| 4. 6200 oranges. | 9. (a) $\frac{3}{7}$; (b) 168000. |
| 5. \$3125. | |

June, 1895.

- | | |
|-----------------|---|
| 1. \$5.70. | 5. \$30. |
| 2. \$134.80. | 6. 660 yds. |
| 3. \$1.13 gain. | 7. $\frac{2}{7}$ of a day; 60c. |
| 4. 34 lb. | 8. (a) $1\frac{5}{21}$; (b) 8275.8620 +. |
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PUBLIC SCHOOL LEAVING, 1896.

ARITHMETIC AND MENSURATION.

1. Find the *product* of the *sum* and *difference* of

$$\frac{\cdot\dot{5} - \cdot\dot{1}\dot{6}}{\cdot 25 + 1\cdot 30\dot{5}} \quad \text{and} \quad \frac{\frac{1}{2} - \frac{1}{9} \times \frac{3}{5}}{3\frac{1}{5} - 1\frac{9}{10}}$$

2. (a) Find the square root of 1.1 correct to three places of decimals.

- (b) Find the cube root of 1953125.

3. Find the alteration in income occasioned by shifting \$5,000 stock from 3 per cents at $86\frac{3}{8}$ to the 4 per cents at $114\frac{7}{8}$; the brokerage being $\frac{1}{8}\%$ on each transaction.

4. A cheese factory shipped 30,000 lbs. of cheese to Liverpool, which a commission merchant sold for 46s. 8d. per cwt. (cwt. = 112.) Find how many cents per lb. were realized on the cheese, the commission being 1%, and freight, insurance, etc., amounting to \$86.25. (£1 = \$4.86 $\frac{2}{3}$.)

5. A and B each lend \$5,000 for three years, one at $4\frac{1}{6}\%$, simple interest; the other at 4% , compound interest. Find the amount of interest each receives.

6. Find the entire cost of enclosing a square field containing 10 acres by means of a wire fence when the wire costs 60 cents per rod, the posts, which are set 10 feet apart, 8 cents each and the work 40 cents per rod.

7. \$1,098.

TORONTO, January 14th, 1896.

One hundred days after date we promise to pay Wm. Jameson, or order, one thousand and ninety-eight dollars, with interest, at 8 per cent. HODGENS BROS.

Find the proceeds of this note when discounted at a bank on March 12th, 1896, at 10% . (year = 366 days).

8. Find the perimeter of a right-angled triangle whose area is 270 square feet, and the base 15 feet.

Value of each, 25.

ENTRANCE ARITHMETIC, 1896.

NOTE.—No marks are to be given for question 8 unless all the addends are correctly written down and the work absolutely correct.

1. How many boxes, each holding $\frac{3}{4}$ of a quart, will be required to hold 12 bu., 3 pk., 1 gal., 2 qt. of strawberries?

2. (a) Reduce to its simplest form :—

$$\frac{1 - \frac{2}{3} \text{ of } \frac{3}{4}}{1 - \frac{1}{3}} \times \frac{\frac{2}{3} + \frac{5}{6}}{1\frac{1}{8}} \div \frac{6}{3}$$

(b) Simplify the following without reducing to vulgar fractions :
 $.0476 \times 4.2 \div .014$.

3. \$1,000.

TORONTO, January 8th, 1894.

One year after date, I promise to pay Gilroy & Wiseman, or order, one thousand dollars with interest at six per cent. Value received. JOHN WILSON.

This note was paid in full on Jan. 25th, 1895. Find the amount.

4. At \$15 per M. board measure, what will be the cost of a 2-inch plank for a 4-foot sidewalk half a mile long?

5. A man earns \$280 in $2\frac{1}{3}$ months. If he spend in $4\frac{1}{6}$ months what he earns in $3\frac{1}{2}$ months, how much will he save in a year?

6. An apple buyer paid \$198 for 126 barrels of apples, consisting of Northern Spies and Wageners, there being $\frac{2}{3}$ as many Northern Spies as Wageners, and the Spies costing 25 cents per barrel more than the Wageners. Find the cost of each kind per barrel.

7. On Monday a grain dealer bought 932 bushels of oats at 21 cents per bushel; on Tuesday 680 bushels at 20 cts.; Wednesday, 836 bushels at 20 cts.; Thursday, 675 bushels at 21 cts.; Friday, 765 bushels at 22 cts.; Saturday, 751 bushels at 22 cts. He then sold the entire week's purchase at 2 cents per bushel above the average cost per bushel. Find :—

(a) the average cost per bushel;

(b) his whole gain;

(c) his gain per cent.

8. Find the sum of the following numbers :—

(i) Nine millions, five hundred and three,

(ii) Eight hundred thousand and four,

(iii) Five hundred and seventy millions and two,

(iv) Three hundred and fifty-three thousand,

(v) Two thousand and four,

(vi) Fifty-eight thousand and fifty-eight,

(vii) Four millions, fifty thousand, three hundred and nine,

(viii) Three hundred and six millions, forty thousand and ten.

Give the result in both figures and words.

Value of No. 7, 16; all the others, 12.

ANSWERS.

ENTRANCE ARITHMETIC.*July, 1896.*

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|------------------------------------|---------------------------------|
| 1. 552 boxes. | 7. (a) 21c. (b) \$92.78. (c) |
| 2. (a) $\frac{5}{16}$. (b) 14.28. | 95 + per cent. |
| 3. \$1062.79 +. | 8. 890,303,890. Eight hun- |
| 4. \$316.80. | dred and ninety millions, three |
| 5. \$230.40. | hundred and three thousand, |
| 6. Spies, \$1.75 ; Wageners, | eight hundred and ninety. |
| \$1.50. | |
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